Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

Vol. XII, No. 1.

(Abstracts Nos 1—301)

School of Agriculture
Cambridge
England

1st January, 1942.

TABLE OF CONTENTS

		PAGE
519	Statistics*	1
575	Breeding* (Empire)	1
	(Foreign)	15
575.1	Genetics* (Empire)	5
	(Foreign	29
576.3	Cytology*	32
578.6	Microscopic Technique	35
58	Botany*	35
632	Plant Diseases and Pests*	35
633	Economic Plants	38
633.1	Cereals (Empire)	5
	(Foreign)	38
633.11	Wheat (Empire)	6
	(Foreign)	39
633.13	Oats	44
633.14	Rye	45
633.15	Maize (Empire)	6
	(Foreign)	46
633.16	Barley (Empire)	7
	(Foreign)	50
633.17	Millets and Sorghum (Empire)	7
	(Foreign)	51
633.18	Rice (Empire)	8
	(Foreign)	51
633.2	Forage Grasses	52
633.3	Leguminous Forage Plants (Empire)	8
	(Foreign)	53
633.4	Roots and Tubers	54
633.5	Fibres (Empire)	9
	(Foreign)	58
633.6	Sugar Plants (Empire)	10
	(Foreign)	60
633.68	Starch Plants	63
633.7	Stimulants (Empire)	11
	(Foreign)	63
633.84	Condiments (Empire)	12
	(Foreign)	67
633.85	Oil Plants (Empire)	12
	(Foreign)	67
633.87	Tanning Plants	69
633.88	Medicinal Plants	69
633.91	Rubber Plants	70
634	Fruits (Empire)	13
	(Foreign)	70
634.3	Citrus Fruits	74
634.5	Nuts (Empire)	13
	(Foreign)	74
634.7	Small Bush Fruits (Empire)	13
	(Foreign)	75
634.8	Viticulture	75
634.9	Forestry (Empire)	13
	(Foreign)	75
635	Vegetables (Empire)	13
	(Foreign)	76
	Book Reviews	85

Note.—Initialled abstracts are written by the following:—

Dr A. B. Bauer	A. B. B.
Dr H. O. Hartley	H. O. H.
Mrs R. M. Ingham	R. M. I.
Mr A. Itriby	A. I.
Dr B. P. Pal	B. P. P.

* General studies, see also individual crops.

PLANT BREEDING ABSTRACTS

Published by the
Imperial Bureau of Plant Breeding and Genetics,
School of Agriculture, Cambridge

Volume XII, 1942

CAMBRIDGE
1942

Plant Breeding Abstracts.

Vol. XII, No. 1.

Part 1. Empire Section

STATISTICS 519

1. COCHRAN, W. G. 519.24

The distribution of the largest of a set of estimated variances as a fraction of their total.

Ann. Eugen. 1941 : **11** : 47–52.

The experimenter is frequently faced with the problem of whether or not an "unusually large" observation should be rejected as unreliable. A similar problem arises when a set of n independent estimates of the same variance contains an individual mean square which appears to be anomalously large. The appropriate solution and test for mean squares of two degrees of freedom was given by Fisher (*Proc. Roy. Soc.* A 125, 54–59). The author generalizes the result to sets of mean squares based on r degrees of freedom each. For small values of r and n the test of significance is facilitated by a small table of percentage points which the author has prepared. For large sets ($n \geqslant \infty$) an approximate test is given. H. O. H.

2. KOSAMBI, D. D. 519.24

A bivariate extension of Fisher's z-test.

Curr. Sci. 1941 : **10** : 191–92.

The conception of a generalized variance is a compound measure of the variability in multivariate samples such as a sample of plants for which a number of attributes has been recorded. The statistical distribution of this statistic was given by Wilks (1932), who also derived a test for the ratio of two independent generalized variances. The author considers the special case of bivariate samples and shows that Fisher's z-test may be applied in this case. In terms of an example, if x and y stand for the heights of father and son respectively, then the generalized variance of heights in a group of n pairs of fathers and sons is measured by

$$(n\text{-}1)^2\sigma x^2\sigma y^2\ (1\text{-}r^2)/4\ (n\text{-}2)^2$$

where σx and σy are, respectively, the standard deviations of fathers' and sons' heights and r is their correlation. If $2n$-4 degrees of freedom are attributed to such a generalized variance Fisher's z-test may be applied to the comparison of two independent variances calculated in this way. H. O. H.

3. CORNISH, E. A. 519.24:631.421

The analysis of quasi-factorial designs with incomplete data. 2. Lattice squares.

J. Aust. Inst. Agric. Sci. 1941 : **7** : 19–26.

There are two types of statistical analysis dealing with incomplete data. The one (of which the well known missing plot technique is an example) deals with experiments where the data referring to a single plot (or to a number of plots with *random* positions) are missing or unreliable. The other deals with cases where the missing plots constitute a definite experimental group such as the plots in a row of Latin Squares or the set of plots treated alike in a randomized Block experiment.

In this paper of his series the author deals with incomplete data of the latter kind and considers Lattice Squares (quasi-Latin-Squares) in which a complete row (column) is missing or where all data referring to a treatment are lost or unreliable. Formulae for the analysis of variance are derived by the standard method of fitting constants. Whilst the case of a "missing treatment" is comparatively easy the analysis of a Lattice Square with a missing row (column) is complicated; the comparison of the yields of plots under the two different treatments has to be carried out in separate groups according to their position relative to the missing row (column). H. O. H.

BREEDING 575

4. BOYES, J. W. 575:576.356.5

A new method of plant breeding.

Pr. Bull. Dep. Ext. Univ. Alberta 1941 : **26** : p. 5.

A popular account of the production of polyploids by colchicine, etc. and of the possible uses of induced polyploidy in plant breeding.

5. MacLean, C. A. 575:633(54.1)
Report of the Agricultural Department, Bihar, for the period from the 1st April, 1938 to the 31st March, 1939 (1941) : Pp. 42.

Rice.
Selections of both winter paddy rices and dry land rices have been made. The selection is made chiefly for quality rather than for high yield. Useful hybrids have also been made between the pure lines isolated some years ago. One of these hybrids combines the full purple colour of one parent with the white, medium grains and good yielding capacity of the other and is expected to be of great value in helping cultivators to rogue out the green-coloured wild paddy from fields.

Winter Cereals.
Varietal trials at the various farms in the province confirm that P.52 wheat, a bearded form which is disease resistant and does not shed its grain, gives higher yields than any other variety. Variety trials were also carried out with oats and barley.

Sunn-hemp (*Crotalaria juncea*).
Two strains, Early Pakur and the Bihar variety, are being studied. Early Pakur gives a low yield of lustrous and soft fibres of medium length. The Bihar variety gives a high yield of long fibres which lack texture. When pure strains of these two varieties have been obtained they will be crossed.

Sugar Cane.
The variety Co.356, bred at Coimbatore from an intergeneric cross between sugar cane and sorghum, has been released for cultivation. It is a thickish, green cane and is a very vigorous grower. It is particularly suited to heavy soil conditions. Other promising varieties are Co.395, Co.393, Co.371, Co.383, Bo.4 and Co.513.

Linseed
An attempt is being made to find a type or types which combine a bold grain and a high oil content with good yield. So far in trials, varieties with high oil contents have poor yields. The linseed strains must also be resistant to wilt and rust. The resistant strain S.6, which has a low oil yield, has been crossed with types in which the oil yield per acre is high. Seventy-one pure lines have been isolated from these crosses and all of them appear to have inherited a resistance to both wilt and rust.

Fruit.
The mango, the litchi and the papaya are being studied. Attempts are being made to obtain pure lines of papaya by continuous inbreeding.

6. Khan, M. S. 575:633(54.2)
Variety improvement work in N.-W. F. province.
Quart. Notes Agric. Dep. N.-W. F. Prov. 1941 : **3** : 1–3.

The introduction of improved varieties of fruits and crops into the North-West Frontier Province has been very successful. Plant breeding has now been started in the province.

7. Rodrigo, E. 575:633(54.8)
Administration Report of the Acting Director of Agriculture for 1939.
Rep. Dep. Agric., Ceylon 1941 : Pp. 34.D.

Paddy.
Breeding work comprises pure line selection in local varieties and in hybrid progenies, including the crosses Java Baiang x Vellai Perunel and Java Baiang x Vellai Illankalayan. Varieties and strains are tested for yield and for resistance to saline conditions, flooding and lodging.

Cotton.
Some selection work with imported cottons is in progress.

Cassava.
Selection work has been started, the objective being a collection of varieties which can be planted together twice a year and harvested monthly throughout the year.

Tomatoes.
The local variety Talatuoya, which shows some resistance to bacterial wilt is being subjected to single-plant and mass selection for resistance.

Brinjal.
A strain almost completely immune to bacterial wilt has been selected from a local variety.

8. 575:633(67.6)

Annual Report of the East African Agricultural Research Station, Amani 1939 (1940) : Pp. 26.

Native Food Crops.
A proposed general scheme for the improvement of native food crops in East Africa comprises the following points:—

a. The collection and study of local varieties at each experiment station.
b. The introduction of new varieties and of new crops.
c. Primary mass selection from local and imported varieties for yield, disease and pest resistance and native preference.
d. Crossing work to be started when it is evident that no further improvement is being obtained by selection.

In this scheme the Amani station would be responsible for (*a*) the general correlation and dissemination of results, (*b*) investigations outside the scope of the agricultural departments, (*c*) the maintenance of a central collection of introduced food plants, (*d*) botanical study of East African food crops, and (*e*) supply of information. With their present numbers and facilities the Amani staff cannot undertake breeding work with native food crops.

Striga.
Preliminary experiments have been carried out with a view to devising a method of testing varietal resistance to *Striga hermonthica.*

Maize.
The high resistance to streak disease of certain lines of the Peruvian Yellow Flint variety was confirmed in 1939 and the breeding of a commercial type from these extremely delicate lines has been included in the 1940 programme of this section.

Agave.
Several species have flowered during the year and a few more crosses have been made. The attempted generic cross *Agave* x *Furcraea* was unsuccessful. Further crosses are planned using other species which are beginning to flower.
Seedling and hybrid material at the Sisal Experiment Station, Ngomeni, has made steady progress: some hybrids will soon be flowering and providing further material for breeding work as well as clonal material for trials.
Germinating seedlings and young plants have been treated with colchicine.

Coffee.
The war has interfered with the crop-recording programme. Vegetative propagation of selected *robusta* trees is proceeding slowly.
Selected inbred plants of *C. arabica* have been selfed and crosses made between *C. eugenioides*, *C. canephora* and *C. excelsa* in all combinations. An unknown *Coffea* species from Madagascar and *C. travancorensis* flowered during the year. The former set fruit but the latter appears to be self-sterile. Seedlings of wild types of *C. canephora* and *C. eugenioides* have been raised from seed collected in Uganda.
Meiosis in the hybrid *C. arabica* x *C. excelsa* material obtained from Uganda was found to be similar to that observed in *C. arabica* x *C. canephora.* At meiosis in *C. arabica* failure of pairing of 2 or 4 chromosomes was found to be more frequent than was at first noted and a further study of meiosis in different varieties and aberrant forms of this species is required.
Germinating seedlings and young plants have been treated with colchicine.

Cassava.
Mosaic disease has been shown to be caused by a group of virus strains varying in virulence. A second distinct virus disease, brown streak, has been recognized.
Progress in the breeding of resistant types has been made possible by the opening in 1938 of the Kizugu sub-station. A trial of 100 clones in triple lattice design was planted in 1938. A high infection was established and wide differences in resistance were found. Imported varieties can now be tested before distribution.
Work on interspecific hybrids was continued and an open pollinated F_2 has been raised from

the cross cassava x *Manihot Glaziovii.* Controlled pollinations will not be made until trials in progress permit the selection of the most promising parents. No hybrids of cassava with *M. dichotoma* have yet contracted any virus disease, but none is of any economic promise and all are apparently sterile.

Cytological studies have shown the following species to have $2n = 36$ chromosomes:— *M. dichotoma* Ule; *M. Glaziovii* Muell. Arg; *Manihot* species received as *M. cathartica*; *M. utilissima* (cassava and a tree form); *M. dulcis* (J. F. Ginel.) Pax.

At meiosis in the pollen mother cells the hybrids between cassava and the tree form had complete pairing, *M. utilissima* x *M. Glaziovii* occasionally had two univalents while in the cross *M. utilissima* x *M. dichotoma* some plants had complete pairing and others a high proportion of univalents.

Buds on rooted cuttings of interspecific hybrids have been treated with colchicine. A plant obtained in this way was shown by root tip studies to be a sectorial chimaera of diploid and tetraploid tissue. The pollen mother cell divisions of other treated material gave no evidence of chromosome doubling.

Aleurites montana.

Yield records from individual trees were started in 1938 and in 1939 the yields were obtained from 136 trees, a sample of the progeny of two trees.

9. 575:633(67.61)

Annual Report of the Department of Agriculture, Uganda for the period 1st January, 1939 to 30th June, 1940 (1941) : Pp. 8.

Native Food Crops.

Promising strains of Eleusine, sorghum, soya beans, etc. have been isolated and are being multiplied.

Cotton.

At Kawanda selection for better lint characters was continued in B.181 and F_2, F_3 and back-crosses of B.181 x B.P.52 were studied.

Work on blackarm resistance was continued at Serere, the most promising strain being derived from B.P.50. It gave the highest yield of seed cotton in a variety trial and is also resistant to jassid.

Coffee.

Breeding work at Kawanda with Robusta coffee was continued. Selected Nganda progenies were found to have beans larger than the average for Uganda Robusta.

Groundnuts.

Successful breeding on a small scale is reported at Serere.

10. VILJOEN, P. R. 575:633(68)

A review of the Union's Agricultural Industry. Annual Report of the Secretary for Agriculture and Forestry for the year ended 31st August, 1939.

Fmg S. Afr. 1939 : 467–594.

Wheat.

New selections of high baking quality are among those bred at Potchefstroom and at Stellenbosch.

None of the selections tested at Stellenbosch for rust-resistance were homozygous for resistance to form 34, to which resistance is chiefly being sought.

Rye.

At Stellenbosch an advanced stage of inbreeding has been reached with Cape rye.

Maize.

At Potchefstroom about 50 crosses have been made between well-known sweet corn varieties and the best inbred lines of field maize.

A new type of maize for silage purposes has been developed and is being distributed to farmers.

Tephrosia.

Some 200 seedlings of *T. capensis* were treated with colchicine in the cotyledon stage. So far no success has been achieved.

Papaya.
A seedling character linked with sex is being sought, to be used in sexing plants in the seed-beds. A purple versus non-purple stem character is so linked, but the linkage is rather loose and its value is therefore limited.

Pineapples.
Seedlings from various crosses have been planted out and are already showing great variation.

Tomatoes.
The variety Marvel, resistant to Fusarium wilt, has been crossed with other varieties to improve its quality.

Beans (Phaseolus).
The varieties Black Valentine, Magpie, Black Wonder, Abundant, Black Prince and Dwarf Signereux have been found more resistant than Canadian Wonder to bacterial blight, but more stringy than the latter. Crosses are being made to improve them.

GENETICS 575.1

11. FISHER, R. A. 575.41:519.24

Average excess and average effect of a gene substitution.

Ann. Eugen. 1941 : **11** : 53–63.

The author clarifies and develops the theory of gene-substitutions. He stresses the difference between the fundamental quantities of the average effect and average excess. It may be assumed that these are equal only for groups for which random mating has for long been the rule. In the light of this distinction the author enters on a critical discussion of a law of "increase in biological fitness" put forward by Sewall Wright (1937). The author's principal objection to Wright's formula is that it yields selection intensity from an *average* behaviour of the species as a whole (change in average survival value) without regard to competition among individuals. He amplifies this point by discussing a hypothetical example which is examined in detail. A hypothetical factor is assumed to affect self-fertilization, and selective activity is shown to be present although there is no change in the average survival value of the population.

The theory of this example involves an interesting mathematical problem: The frequencies of three types of fertilization are linked from generation to generation by three non-linear recurrence equations of a type frequently met with in genetic problems. An approximate general solution of these equations is given with the help of power series and the accuracy of the solution is checked in a special case where the recurrence formulae were worked out by the tedious numerical process. H. O. H.

CEREALS 633.1*

12. 633.1:575(41)

The Scottish Plant Breeding Station, Craigs House, Corstorphine, Edinburgh.

Trans. Highl. Agric. Soc. 1941 : **53** : 103–06.

A review is given of the breeding of grain crops at this station. There are three main problems being tackled in the oat breeding. The first is the breeding of highly productive oat varieties that will be resistant to lodging when grown on the more fertile soils. The short-strawed semi-dwarf oat has been largely used as a parent in this work. Secondly, efforts are being made to see how far the combination of high grain yield, early maturity and hardiness for Scottish conditions can be secured. The third problem in the oat breeding programme is the attempt to produce an oat which is resistant to sprouting at harvest time by crossing the wild oat (*Avena fatua*) with certain cultivated varieties. A selection of Scots Common barley has been increased and is being tested in the north of Scotland. Scots Common barley has been crossed with Plumage Archer in an attempt to obtain a type of common barley with good quality grain and the standing capacity of Plumage Archer. Polyploid forms of barley have been obtained by colchicine treatment. The main object in the wheat breeding is the production of early-ripening spring forms resistant to lodging and resistant to loose smut. Selections of field beans have been made.

---

* See also Absts 5 and 10).

WHEAT 633.11*

13. 633.11:575(42)

Steadfast winter wheat.

Nat. Inst. Agric. Bot., Cambridge : Pp. 4.

The release is announced of the new variety Steadfast, bred at the Cambridge University Plant Breeding Institute and previously known by the number 198(20c). Descended from a cross between Little Joss and Victor, it has short straw, high tillering, white, large grain, red chaff and resistance to yellow rust. It ripens about the same time as Little Joss, which it excels in yield and possibly in range of soils to which it is adapted. Its milling quality is about the same as most of the softer English wheats.

14. 633.11:575(94)

Fourteenth Annual Report of the Council for Scientific and Industrial Research, for year 1939-40.

Gov. Commonwealth Aust. 1940 : Pp. 102.

The yield attributes of wheat, number of ears per plant, number of grains per ear and average grain weight having been shown to be quite independent, attempts are now being made to combine high values of each in one variety.

15. WENHOLZ, H.,
PRIDHAM, J. T.,
VEARS, C. K. and
CURTEIS, W. M. 633.11:575(94)

Wheat varieties in Australia.

Agric. Gaz. N.S.W. 1941 : **52** : 205–09, 260–64, 305–08, 355–58.

This serial article (cf. "Plant Breeding Abstracts", Vol. XI, Absts. 17 and 521) is brought to a conclusion in these four instalments. Many further varieties are described in alphabetical order, beginning with Quail and ending with Zulu. Special mention is made of Ranee (now the third leading variety in Australia), of the work of W. J. Spafford and R. C. Scott (breeders of the varieties Ford and Sword), of Waratah (the leading variety of wheat in New South Wales in 1929) and of the work of J. Ward (selector of Ward's Prolific) and of G. F. Berthoud (who introduced Zealand wheat, a most productive hay variety).

16. BARTLETT, H. 633.11–2.452–1.521.6:575(94.4)

New wheats for the North-west.

Agric. Gaz. N.S.W. 1941 : **52** : 184–88.

Three new varieties of wheat—Fedweb 1, Eureka and Bordan—which are suited to the north-western districts of New South Wales, where conditions are ideal for the rapid development of stem rust, are described.

Fedweb 1 has been bred by Dr. W. L. Waterhouse of Sydney University assisted by C. H. Beeson and J. A. O'Reilley. Its parents are Federation (one of Farrer's wheats) and Webster (a Mongolian wheat with a very high resistance to stem rust). It has high resistance to stem rust (but not immunity such as is possessed by Eureka) and moderate resistance to leaf rust. It is susceptible to flag smut. Fedweb 1 is a late maturing variety and has a strong, short, stiff straw. The grain has satisfactory milling and baking qualities.

Eureka has been previously described (see "Plant Breeding Abstracts", Vol. X, Abst. 15).

Bordan is a wheat of maturity and general agronomic characters similar to Ford. It originated from the cross Bearded Rieti x Ford x Dan. It is almost as resistant to stem rust as Ford and is superior in flag smut resistance. Bordan is likely to prove superior to Ford in certain areas.

17. SIM, J. T. R. 633.11:664.641.016(68)

The baking quality of South African wheat varieties.

Sci. Bull. Dep. Agric. S. Afr. 1938 : No. 184 : Pp. 110.

Methods of testing baking quality are described in some detail and the baking qualities of a large number of South African wheat varieties are summarized.

MAIZE 633.15†

18. KERLE, W. D. 633.15:575.12

Hybrid maize will substantially increase yields.

Agric. Gaz. N.S.W. 1941 : **52** : 403–4.

A brief popular account.

---

* See also Absts 5 and 10. † See also Absts 8 and 10.

19. Chin, T. C. 633.16:576.312.35:576.356.5
The cytology of some wild species of *Hordeum*.
Ann. Bot., Lond. 1941 : **5** : 535–45.

An abstract of the work described in this paper has already appeared (see "Plant Breeding Abstracts", Vol. XI, Abst. 269). More details are given in this paper of meiosis in the autotetraploid *H. bulbosum* L. which had a mean quadrivalent frequency of 4·2 per cell. Misdivision of the centromeres of univalents was observed at both divisions of meiosis in this species.

20. Anderson, J. A.
Sallans, H. R. and
Meredith, W. O. S. 633.16:581.6:519.241.1
Varietal differences in barley and malts. XII. Summary of correlations between 18 major barley, malt and malting properties.
Canad. J. Res. 1941 : **19** : Sect. C : 278–91.

In the twelfth paper of the series a brief summary of the results of the correlation studies made during the course of the investigations is given. All determinations were made on the same set of 144 barleys (12 varieties grown at 12 widely separated experimental stations) and their corresponding malts. Eleven barley properties (total nitrogen %, glutelin nitrogen %, hordein nitrogen %, salt-soluble nitrogen %, 1,000-kernel weight, starch %, insoluble residue %, extract %, wort nitrogen %, diastatic activity and hours to steep to 44%) and seven malt properties (malting loss %, wort nitrogen %, extract %, diastatic activity (Lintner), proteolytic activity, autolytic diastatic activity and starch liquefying activity) were studied. The 289 simple intravarietal correlation coefficients and corresponding partial correlation coefficients, independent of total nitrogen, for these barley and malt properties are given in a table. In a second table the 289 simple intervarietal correlation coefficients and corresponding partial correlation coefficients, independent of salt-soluble nitrogen, are given. The intravarietal correlation coefficients will be of most interest to the maltster and the intervarietal correlation coefficients of more interest to the plant breeder and to the cereal chemist who is assisting in the development of the new malting barleys. With a thorough knowledge of the intervarietal relations and associations that exist between barley and malt properties, it is possible to form a fairly reliable judgment of the comparative malting qualitities of new varieties from the results of analysis of the barley and thus in the early stages of a breeding programme it should be possible to do without the malting test without danger of discarding new lines with superior malting qualities.

MILLETS AND SORGHUM 633.17

21. MacVicar, R. M. and 633.171:575.11.061.6
Parnell, H. R. 633.171:581.162.32
The inheritance of plant colour and the extent of natural crossing in foxtail millet.
Sci. Agric. 1941 : **22** : 80–84.

From the segregation in F_2 and F_3 progenies of natural crosses it was confirmed that purple plant colour is a simple dominant over green in *Setaria italica*.
Green and purple plants were planted alternately, in isolation from other millets and progenies were grown from 64 green plants. Of these, 40 contained no purple plants and the remaining 24 contained from 0·52 to 4·93% of purple plants. Totalling all progenies, there were 49 purple among 7,115 seedlings, or 0·689%.

22. Krishnaswami, N. and
Rangaswami Ayyangar, G. N. 633.171:576.356.2:537.531
Chromosomal alterations induced by X-rays in Bajri (*Pennisetum typhoides* Stapf & Hubbard).
J. Indian Bot. Soc. 1941 : **20** : 111–17.

Resting seeds of Bajri were treated with X-rays. In the longest treatment (3 hours) no seedlings were obtained and most of the seedlings obtained from the 2 hours treatment were albinos. Meiosis was investigated in those seedlings which matured. Four of them were found to have segmental interchanges and to be semi-sterile. One of the plants was also heterozygous for an inversion.

23. PAL, B. P. and RAMANUJAM, S. 633.18:575.11.061.633
A new type of variegation in rice.
Indian J. Agric. Sci. 1941 : **11** : 170–76.
A variegated rice plant with fine stripes of green and white on the stem, foliage and glumes is described. When selfed, such plants give rise to variegated and albino plants in varying proportions but when crossed reciprocally with green plants, give rise to green plants only, in the F_1. The heterozygous green plants segregate into green and variegated plants in the ratio of 3 : 1. Study of the breeding behaviour showed that while variegation is a mendelian recessive to green, albinism is transmitted only maternally. B. P. P.

24. NANDI, H. K. and GANGULI, P. M. 633.18:575.11"793"
Inheritance of earliness in Surma Valley rices.
Indian J. Agric. Sci. 1941 : **11** : 9–20.
A fuller account of the paper abstracted in "Plant Breeding Abstracts", Vol. XI, Abst. 32.
B. P. P.

25. RAMIAH, K. and RAMASWAMI, K. 633.18:581.143:575.11.061.1
Floating habit in rice.
Indian J. Agric. Sci. 1941 : **11** : 1–8.
In a cross between an ordinary and a deep-water rice, the floating habit of the latter was shown to be controlled by duplicate recessive genes designated ef_1 and ef_2, a ratio of 15 normal : 1 floating being realized in F_2. B. P. P.

LEGUMINOUS FORAGE PLANTS 633.3†

26. ARMSTRONG, J. M. and GIBSON, D.R. 633.31:575.127.2:575.11
Inheritance of certain characters in the hybrid of *Medicago media* and *Medicago glutinosa*.
Sci. Agric. 1941 : **22** : 1–10.
M. glutinosa is a Caucasian species, prostrate, with a slight tendency to creep by stolons. Its leaves are small and profuse; flower colour varies from deep purple to cream with many variegated blossoms. Its leafiness and persistence make it a promising pasture type but its poor seeding habits are a serious disadvantage. To remedy this it has been crossed with an autogamous selection (Aa 88) from Grimm lucerne (*M. media*).
The selection of *M. glutinosa* used in the crosses had cream coloured flowers, Aa 88 having medium dark purple flowers free from variegation. When selfed Aa88 gave a range of flower colours from light purple to dark purple. The F_1 plants had variegated flowers with the outer portion of the standard and the tip of the keel purple, the inner portion of the standard and the lower part of the keel deep yellowish cream. In the different F_2 families, purple and cream occurred in ratios of 3 : 1, 15 : 1 and 63 : 1 and to explain this the following factorial constitutions for the parents are suggested: Aa 88—$P_1P_1P_2p_2P_3p_3$, *M. glutinosa*—$CCp_2p_2p_3p_3$, where P_1P_2 and P_3 are factors for purple flower colour and C, allelomorphic to P_1, a factor for cream colour. The purple ranged from light to very dark, the occurrence of the latter being attributed to an intensifying factor from *M. glutinosa* or to factor interaction.
M. glutinosa has upright, sticky hairs on its pods, while Aa 88 has scanty, appressed hairs. The *glutinosa* condition was dominant in the F_1. In most of the F_2 families studied, a ratio of 3 upright : 1 appressed was obtained but in three the segregation was into 9 appressed : 4 intermediate : 3 upright. It is concluded that Aa 88 was heterozygous for a dominant inhibitor, its constitution being *ggIi* and *M. glutinosa GGii*.
Growth habit (erect-prostrate), stoloniferous habit and leaf shape and size were all apparently determined by multiple factors. Different segregations were obtained in different F_2 families. Although strongly spreading types were recovered in F_2, the non-spreading types were much more frequent. Leaf length and width were correlated slightly with growth habit.

---

* See also Absts 5 and 7. † See also Abst. 10 (Tephrosia).

27. Horner, W. H. and
White, W. J. 633.366:581.192:575.11
Investigations concerning the coumarin content of sweet clover. III. The inheritance of the low coumarin character.
Sci. Agric. 1941 : **22** : 85–92.

F_1, F_2 and F_3 results from crosses of low- and high-coumarin lines of *Melilotus alba* show, in spite of certain difficulties in classification, that high coumarin content (greater than 0·10% of fresh weight) is a simple dominant over low coumarin content (less than 0·05%). No evidence of any genetic basis for differences within these two groups could be found. The classification of plants with between 0·05 and 0·10% coumarin is doubtful. No linkage was observed between coumarin content and the "Alpha" (fine-stemmed dwarf) habit or white sepals.

FIBRES 633.5*

28. 633.51:575(54)
Annual Report of the Indian Central Cotton Committee for the year ending 31st August, 1940.
Bombay 1940 : Pp. 183.

Fundamental research on gentics and plant physiology at the Institute of Plant Industry, Indore is now controlled directly by the Committee and located as a separate scheme, the Cotton Genetics Research Scheme, concerned with genetical investigations, methods of sampling, field plot technique and statistical investigations in relation to genetics. Sterility in the Million Dollar sterile mutant is due to asynapsis, controlled by a single gene independent of *R*, *L* and *Y*. The Punjab hairy lintless gene causes varying degrees of lethality when homozygous. The 1027 A.L.F. lintless gene Li_a is independent of *R* and *L* and is complementary to the Punjab glabrous lintless gene Li_b. The unexpected occurrence of linted plants in otherwise lintless progenies needs further investigation. The identification of a new member of the anthocyanin allelomorphic series in Tellapatti (*G. arboreum* var. *neglectum* forma *indicum*) has been confirmed and its inheritance studied. A virescent, X-ray induced mutant with yellow colour in the young leaves is viable. Statistical studies on the inheritance of staple length in crosses between the *G. arboreum* var. *neglectum* strains Bani, Malvi C.520 have shown that the genetic portion of the F_2 variance can be estimated from the regression of the F_3 progenies on their F_2 parents. The smallness of the genetic fraction in the cross Malvi x Bani confirms the close relationship of these varieties. In studying the effect of selection and comparing different genetical hypotheses, statistical methods based on the moment-generating functions of multi-variate distributions have been developed. The best results in the induction of polyploidy by seed treatment were obtained by soaking dry seeds in 0·1% solution for 4 to 8 hours. When plumules were painted 4 to 6 times a day with colchicine solution the best results were obtained with 0·2 to 0·3% solutions. Breeding work is concentrated on the development of a highly wilt-resistant strain to replace Malvi 9. Different methods of selection in hybrid progenies are being studied. Resistant strains have also been obtained by ordinary selection.

Rather detailed reports on the progress of the different schemes are given, of which the following is of more general interest. Hybridization between American and Asiatic cottons is being studied at Surat. Of the 23 hybrids previously obtained, 21 are triploid (2n = 39), one tetraploid and one pentaploid. By back-crossing to the American type 27 plants have been obtained, of which 15 are more or less fertile and one, B.C. No. 22, fully fertile. It has the parentage (Co.2 × Red arboreum) × Co.2; Co.2 is an acclimatized type of *G. hirsutum*. F_3 progenies from this cross have been selected for superior fibre characteristics and selections have been made from the F_2 of other back-crosses. During the year under review nearly 225,000 flowers of the hybrids (which have been maintained as rattoons and by cuttings) have been back-crossed and 64 seeds obtained. Colchicine treatment has produced apparent signs of chromosome doubling in 4 out of 17 sterile hybrids. Physical treatment failed to induce fertility.

---

* See also Absts 7 and 9 (Cotton); Abst. 5 (Sun-hemp); Abst. 8 (Agave).

29. RAMIAH, K. 633.51:575(54)
A short review of genetical and plant breeding work in cotton with suggestions for the future.
Indian Cent. Cott. Comm., 2nd Conf. Sci. Res. Wkrs Cott. India, Genet. and Pl. Breed. Paper No. 1 : Pp. 7.

The topics discussed in this short review are selection, quantitative inheritance, breeding for quality, choice of parents for crossing, discriminant function, correlation and linkage, breeding for wilt resistance, species relationship, collection of breeding material and maintenance of purity of strains. Suggestions are made for future genetical and breeding work with cotton in India. The author emphasizes the inter-relationship of genetical and plant breeding work.

30. RAMIAH, K. and
GADKARI, P. D. 633.51:575.41:631.524
A note on deterioration and acclimatization of strains.
Indian Cent. Cott. Comm., 2nd Conf. Sci. Res. Wkrs Cott. India, Genet. and Pl. Breed. Paper No. 16 : Pp. 4.

Deterioration of a particular strain or variety of cotton under cultivation may be due to either non-genetic or genetic causes. In the non-genetic causes the authors include mechanical mixture of seeds, natural crossing in fields and extension of the cultivation to areas not particularly suited to that variety. The genetic causes for deterioration are grouped under either segregation or mutation and selection pressure. It is pointed out that strains released for distribution consist of several genotypes differing in their constitution as regards many physiological characters.

Acclimatization is discussed in the second part of the article. It is suggested that acclimatization must mean the existence of genetic variability in the material and the consequent selective action of environment on the more favourable genotypes. The "New Place Effect" refers primarily to the temporary and permanent changes, peculiar to the place alone, suffered by the strain in response to a new environment.

31. RAMIAH, K. and
GADKARI, P. D. 633.51:581.162.5:576.356:575.11
Further observations on sterility in cotton.
Indian J. Agric. Sci. 1941 : **11** : 31–36.

In 1935 Hutchinson and Gadkari (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1086), described a sterile mutant in *G. arboreum* and showed that the gene responsible for sterility [subsequently given the symbol *stp* by Hutchinson and Silow (cf. "Plant Breeding Abstracts", Vol. X, Abst. 490)] behaved as a simple recessive. This mutant has now been cytologically examined by the present authors and it is demonstrated that the sterility was caused by asynapsis. The gene *stp* assorts freely with the genes controlling corolla colour, anthocyanin and leaf shape. B. P. P.

32. 633.523:575(81)
633.523–1.524(81)
Indian jute grown in Brazil.
Statesman, Calcutta 1941 : **107** : No. 21172 : p. 3.

In 1936 a successful attempt was made under the guidance of Mr Uetsuka (private secretary to the Japanese Finance Minister, Mr K. Takahashi), to promote the growing of Indian jute in Brazil. The plants raised on the experimental farms there were taller than the original Indian types and the Japanese have developed a new variety called Oyama, since which the jute output is rapidly increasing each year.

SUGAR PLANTS 633.6*

33. DODDS, H. H. 633.61:575(68)
Notes on the sugarcane variety position in South Africa, 1941.
S. Afr. Sug. J. 1941 : **25** : 353–61.

Summaries are given of yield and performance tests of sugar cane varieties such as Co.281, Co.290, Co.301 and Co.331 in S. Africa. The last section of the paper deals with the development of seedling varieties in S. Africa from imported seed. Seed has been received from Coimbatore, Mauritius and Hawaii. Promising seedlings have been obtained from the crosses P.O.J. 2725 x either Co.214, Co.281 or Co.301.

---

* See also Abst. 5 (Sugar cane); Absts 7 and 8 (Cassava).

34. STEVENSON, G. C. 633.61:575(69.82)
Part I—Geneticist's Division.
11th Rep. Sug. Cane Res. Sta. Mauritius 1940 (1941) : 6–11.
Conditions were very favourable for cane breeding in the research year 1940 and the whole of the crossing programme, which had been drawn up before the arrowing season, was carried out almost in its entirety. The breeding programme consisted of crosses between noble canes, the nobilization of the following species—*S. spontaneum* (Java, Indian and N. Celebes types), *S. Barberi*, *S. sinense* and *S. robustum*—and some crosses involving several *Saccharum* species. A cross between a noble cane and a local *S. spontaneum* gave abundant seedlings of the Uba Marot type (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 569). Experiments on the induction of polyploidy by the use of colchicine have been carried out.

35. MCINTOSH, A. E. S. 633.61:575(72.92)
British West Indies Central Sugar Cane Breeding Station. A progress report on the work of the station for Jamaica.
J.A.S.T. Quart. 1941 : **4** : No. 3 : 42–62.
It is pointed out that the presence of sugar cane mosaic disease in all cane growing areas determines to a very large extent the varieties grown in Jamaica. Details are then given of the 63 seedlings which have been received in Jamaica from the British West Indies Central Sugar Cane Breeding Station. The parentage, reaction to mosaic disease and performance in field tests are given for each seedling.

36. B . . . ., A. F. 633.61:575(94.3)
New seedlings for field trial at Mackay.
Cane Gr. Quart. Bull. 1941 : **9** : p. 23.
Two new promising varieties, Q.28 and Comus, are described. Q.28 is a seedling from the cross Co.290 x Q.1098. Its sugar content is not high but it is higher than that of Co.290. It is resistant to downy mildew. Comus is a seedling from the cross Oramboo x Q.813. It is a stout soft cane of high resistance to downy mildew. It is, however, highly susceptible to mosaic disease.

37. VENKATRAMAN, T. S. 633.61:575:575.127.2
Cultivated and wild plants.
Indian Fmg 1941 : **2** : 358–59.
A popular article. Short descriptions are given of the "noble" canes, of the sub-tropical or the medium group and of the wild species of *Saccharum*. Mention is made of the use of all three types in breeding the new Co. canes which are complex hybrids.

38. EVANS, H. 633.61–2.7–1.521.6
Part III—Research botany.
11th Rep. Sug. Cane Res. Sta. Mauritius 1940 (1941) : 17–29.
Investigations on the resistance of sugar cane varieties to borer damage indicate that it is possible to forecast the borer resistance of new varieties from adequate determinations of the lignin content of their tissues. *Phytalus* resistance investigations were also carried out. The results indicate that the yield of cane produced under *Phytalus* conditions is dependent on the reserve power of the root system, a character which may be expressed as the number of root primordia held in reserve and capable of germinating under the stimulus of root pruning induced by *Phytalus*.

STIMULANTS 633.7*

39. 633.72:575(54.8)
15th Annual Report of the Board of the Tea Research Institute of Ceylon for 1940.
Bull. Tea Res. Inst., Ceylon 1940 : No. 2 : Pp. 86.
In the selection work 2,762 bushes have now been examined for yield and the high-yielding bushes tested for quality in manufacture tests. The clones chosen on the basis of both yield and manufacture now number eight.
Work on the propagation of cuttings was continued.

---

* See also Absts 8 and 9 (Coffee).

40. Bond, T. E. T. 633.72:575.42(92.2)
The present position of tea selection in Java. (Review).
Tea Quart. 1941 : **14** : 23–30.

This article is based on and in part freely translated from recent papers by S. J. Wellensiek (cf. "Plant Breeding Abstracts", Vol. X, Abst. 834) and I. J. H. van Emden in *De Bergcultures*. Clone testing, nursery selection, the establishment of budded plants and quality testing are the subjects considered.

41. Bond, T. E. T. 633.72–1.421:581.165.1(92.2+92.1)
Clone testing in the field. (Review).
Tea Quart. 1941 : **14** : 61–64.

A review of a paper by I. J. H. van Emden (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 1058) describing the arrangements for the trial of selected tea clones on a field scale by estates throughout the tea growing districts of Java and Sumatra. The subjects discussed are the scope of the experiments, the experimental procedure, planting methods and judging the results. The financial and other considerations involved in large scale co-operative experiments of this sort are also considered.

42. Cheesman, E. E. 633.74:575(72.98)
The case for long range research in cacao production.
Trop. Agriculture, Trin. 1940 : **17** : 203–07.

The work of the Cacao Research Scheme at the Imperial College of Tropical Agriculture during the ten years 1930–40 is summarized and suggestions are made for future work. Mention is made of selection for high yield, of self-incompatible and self-compatible trees, botanical varieties and resistance to Witches' Broom and to attack by cacao thrips.

43. Billes, D. J. 633.74:581.162.3
Pollination of *Theobroma cacao* L. in Trinidad, B.W.I.
Trop. Agriculture, Trin. 1941 : **18** : 151–56.

In Trinidad pollination of cacao has been shown to occur only through the agency of insects. The insects of importance in causing self-pollination are the pollination midge *Forcipomyia* sp., the thrips *Frankliniella parvula* and the aphid *Toxoptera aurantii*. Cross-pollination has been shown to be due to flying insects and the only probable agency is *Forcipomyia* sp.

44. Salmon, E. S. 633.79:575(42)
Trial of new varieties of hops, 1940.
24th Rep. E. Malling Res. Sta. 1941 : Pp. 21.

The yield and α and β resin contents are given for a number of new varieties of hops (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 54). The origin of these varieties is described. Their valuation and brewing trials are also discussed. Observations were made on the incidence of downy mildew, mosaic and Verticillium wilt.

CONDIMENTS 633.84

45. Swamirao, R.,
Narasimharao, M. P. and
Ramaswami, S.T. 633.842:581.162.3:578.08
Emasculation in chillies (*Capsicum* genus).
Curr. Sci. 1941 : **10** : p. 296.

Chillies can be emasculated satisfactorily and quickly by removing the whole corolla tube plus the epipetalous stamens. Preliminary trials suggest that this method can be used for tobacco and many other flowers with epipetalous stamens.

OIL PLANTS 633.85*

46. Putt, E. D. 633.854.78:581.162.5:575:575.14
Investigations of breeding technique for the sunflower (*Helianthus annuus* L.).
Sci. Agric. 1941 : **21** : 689–702.

Methods for the emasculation and pollination of sunflowers are described. Pollen can be stored for at least one week and possibly for two without loss of viability. Inbreeding caused an increase in uniformity within lines and a decrease in self-fertility. Noticeable differences in the degrees of self-fertility of material from different sources were also found.

---

* See also Abst. 5 (Linseed) and Abst. 8 (Aleurites montana).

FRUITS 634*

47. CRANE, M. B. 634:581.162
The production of fruit.
J. Roy. Hort. Soc. 1941 : **66** : 350–57.

The principles of pollination and fertilization are explained, with special reference to self-incompatibility in cherries, plums, apples and pears.

48. TYDEMAN, H. M. 634.11–2.952–1.521.6:575.11
The inheritance of susceptibility to sulphur damage in families of seedling apples.
J. Pomol. 1941 : **19** : 137–45.

The percentage of seedlings showing defoliation after applications of sulphur-containing sprays was studied in a number of apple progenies. Crosses involving Stirling Castle (a "sulphur shy" variety) had 21% of defoliated seedlings and crosses involving White Transparent, Rote Sommer Apfel and Cox's Orange Pippin about 6% of such seedlings. Further analysis showed that the proportions of sulphur shy seedlings in families of which Stirling Castle was one parent varied according to the other variety used as parent. It is concluded that the inheritance of sulphur shyness in apples is controlled by a number of genes.

NUTS 634.5†

49. BABU, C. N. 634.58:576.356
Certain abnormalities in the root tip of groundnut.
Curr. Sci. 1941 : **10** : 291–92.

The following abnormalities are reported in root tip mitoses of *Arachis hypogaea*—two fragments; a ring chromosome; a lateral satellite; and a tetraploid cell showing pronounced somatic pairing.

SMALL BUSH FRUITS 634.7‡

50. 634.75:575(93.1)
Plant recording. Strawberry "Victory," raised by Arthur G. Sainsbury, Mangere, via Otahuhu.
J. N.Z. Inst. Hort. 1941 : **11** : p. 13.

Victory is a strawberry variety raised by seed in two stages from the English variety Royal Sovereign. A description of the plant and fruit is given.

FORESTRY 634.97

51. 634.97:575(48.5)
Improvement of forest trees in Sweden.
Anglo-Swedish Rev. 1941 : 93–94.

Among the activities mentioned in this brief account of the work of the Association for the Improvement of Forest Trees are the work on giant (polyploid) types of broad-leaved trees, mainly aspen and birch, selection for resistance to autumn frost and to rot in fir, colchicine treatment of germinating fir seeds, girdling and grafting work with pines.

VEGETABLES 635§

52. GILES, W. F. 635.35:576.16(42)
Cauliflower and broccoli. What they are and where they come from.
J. Roy. Hort. Soc. 1941 : **66** : 265–77.

The varieties of cauliflower, broccoli (white headed types) and coloured headed and sprouting broccolis grown in England are described. The origin of the different types is also discussed. It is suggested that the nomenclature would be much simplified if all types producing solid heads, whether white or coloured, were classified as cauliflowers and all sprouting or branching types as broccolis.

---

* See also Absts 5 and 10 (Papaya).
† See also Abst. 9 (Groundnut). ‡ See also Abst. 10 (Pineapple).
§ See also Absts 7 and 10 (Tomato); Abst. 7 (Brinjal); Abst. 10 [Beans (Phaseolus)].

53. HATCHER, E. S. J. 635.64:575.125

Studies in the inheritance of physiological characters. VI. Hybrid vigour in the tomato. Part IV. The effect of flower removal on the manifestation of hybrid vigour.

Ann. Bot. Lond. 1941 : **5** : 501–08.

The two parent strains and their reciprocal hybrids used in this investigation have been studied previously (see "Plant Breeding Abstracts", Vol. XI, Abst. 309). The present experiment consisted in removing the flowers as they were formed in some plants and comparing the heterosis shown by these plants with that shown by normal ones. The removal of flowers did not interfere with the manifestation of hybrid vigour. It is concluded that the combination in the hybrids of vegetative and fruiting characters inherited from the parents does not in itself account for heterosis and it is suggested that some specific effect of hybridity leads to the greater vigour of growth in the hybrids.

Part II. Foreign.

BREEDING 575

54. DAVIDSON, W. A. 575:35(73)
Questions and answers concerning the Federal Seed Act.
Seed World 1940 : **47** : No. 7 : 12–13.
Under the Federal Seed Act which came into force in the U.S.A. on February 5, 1940, varietal names attached to lots of seed appear to acquire a legal status. The varietal name, when given, should be traceable to a declaration of variety issued by the grower or "country shipper" of the seed and should have adequate information to support it. The name given must be the recognized name of the variety or type, e.g. a maize hybrid produced by the U.S. Department of Agriculture or a state experiment station should be identified by the designation given it by that institution.

55. BRIGGS, F. N. 575:633(4)
Plant breeding and seed control stations in the British Isles.
Seed World 1940 : **48** : No. 9 : p. 14.
After describing very briefly the work he saw in France, England and Scotland (mainly at Vilmorin-Andrieux, Cambridge and Corstorphine) the author concludes that the methods of breeding are not very different from those in the U.S.A., but that the work is on a more modest scale and slower, possibly because of the higher standard of European varieties.

56. GROSSMAN, Ju. Ju. 575:633(42)
(F. F. Hallett's methods of breeding).
Socialistic Grain Farming, Saratov 1940 : No. 4 : 164–67.
Reference is made to the work of the well-known English breeder.

57. MEYER, K. 575:633(43)
Unsere Forschungsarbeit im Kriege. Hauptbericht anlässlich der Kreigstagung 1941 des Forschungsdienstes. (**Our research work in the war. Principal report on the occasion of the 1941 war meeting of the Research Service**).
Forschungsdienst 1941 : **11** : 253–86.
Inter alia, German plant breeding work is briefly reviewed, with special reference to the task of making Germany more self-sufficient in respect of protein and fat.

58. 575:633(43)
TELSCHOW, E. 575.1(43)
Tätigkeitsbericht der Kaiser Wilhelm-Gesellschaft zur Förderung der Wissenschaften für das Geschäftsjahr 1940–41. (**Report of the activities of the Kaiser Wilhelm Society for the Advancement of the Sciences for the year of work 1940–41**).
Naturwissenschaften 1941 : **29** : 425–33.
Genetical and plant breeding work was carried out by the following institutes: Kaiser Wilhelm Institute for Bast Fibre Research (Prof. Schilling); Kaiser Wilhelm Institute for Biology (Prof. v. Wettstein, Prof. Kühn and Prof. Hartmann), Kaiser Wilhelm Institute for Breeding Research (Prof. Rudorf).

59. 575:633(47)
RJAZANOV, Ja. 633.11:575(47)
(Brief summary of results and the problems of the South-eastern Research Institute for grain culture).
Socialistic Grain Farming, Saratov 1940 : No. 1 : 7–29.
Among the new spring wheats produced the following are specially mentioned: Lutescens 55/11, combining high yield and baking quality with resistance to loose smut; Albidum 51, combining similar qualities with bunt resistance; Lutescens 53/12, resistant to drought; Albidum 43, which has given extremely high yields, exceeding Lutescens 62 by 20–35·4%. The awnless *T. durum* variety Mutico-Valencia C-31 has outyielded Hordeiforme 432 by 20·6% over a period of 5 years. Two varieties of spring wheat bred for irrigated land have shown improved yield, good grain quality, strong straw and resistance to *Puccinia triticina* and *P. glumarum*.

Among the winter wheats the wheat rye hybrids Erythroleucon 76 and Lutescens 127 have proved promising, combining good grain quality with resistance to frost and drought. The same applies to a hybrid of Erythrospermum 46 131 with 118. The best winter wheat for irrigated land is Erythrospermum 118, which is winter hardy and productive, and has strong straw and good quality grain.

Good yields have been observed from *Secale Agropyron* hybrids and some of the spring and winter annual *Triticum-Agropyron* hybrids.

Other products of the breeding work are sunflowers with higher oil content and improved varieties of millet.

60. 575:633(47.8)

(Bulgarian Agricultural Association, Sofia Report on the activity of the Association during the year 1937).

Zemledelie, Sofia 1938 : **42** : No. **4** : 5–31.

Among the activities of the Bulgarian Agricultural Association were the following: —

Pyrethrum.

Research on pyrethrum has been intensively pursued since 1937.

Individual selection of plants has been carried on to fix varieties with a high pyrethrin content. Plants obtained by mass selection have been multiplied up to obtain seed for regional tests in various parts of the country.

The pyrethrin content of some pure lines is being determined to ascertain their constancy in each year of the experiment and similar determinations are also being made from crops of pyrethrum in various districts.

Experiments on pollination of the plant have been continued.

Four pure lines Nos. 4, 21, 25, and 26 have been obtained with an average pyrethrin content for the period 1934–1937 of 1·539, 1·706, 2·234 and 1·704 respectively. In 1937 four other lines, No. 250 (with 1·43% pyrethrin), No. 4a (with 1·57%), No. 4b (with 1·47%) and No. 4c (with 1·79%), were isolated.

Regional trials with the co-operation of farmers in about 32 districts in Bulgaria resulted in returns of over 1% pyrethrin content for all districts except Komarevo. At three centres it was over 1·5%, and at 16 centres from 1·25 1·5%. Mod'r tepe and other high lying parts showed percentages ranging from 2·23 to 1·49. These investigations are to be continued in connexion with cultural experiments.

Future research with select seed should give even more encouraging results.

Pollination experiments were carried out to obtain seed (1) from spatially isolated individual lines, (2) by selfing and (3) by crossing.

The first method gave no set, nor did the second from any of the combinations used. In the latter case it is deduced that pollination in pyrethrum is effected by insects, but which particular species may be concerned remains to be studied. In the third experiment, which is not yet finished, facilities for natural cross-pollination by insects were provided.

Oats.

In comparative trials with Swedish and locally grown types of oats in the T'mr'Sku Basin Victory gave a yield of 88 kg. or 122·5% more grain per dekar — 0·247 acres, than the oat of the locality which gave only 72 kg. per dekar.

Fodder Beet.

Fodder beet breeding and seed production were begun by the Association with the variety Kirše Ideal in 1935 and in 1937 typical roots were chosen from 14 pure lines and uniform seed plants and high quality seed were obtained from lines Nos. 43, 109, 199, 1916, 512 and 1070. The seed collected will be used to test the constancy of the lines for root shape, leaves, rosette, etc., and also dry matter content and resistance to drought. This seed is to be used for comparative trials from which flowers of the best lines as regards yield, drought resistance and dry matter content will be chosen for seed.

In a second series of experiments seed from 21 pure lines was used in another comparative trial at Plovdiv. Ten lines which gave good yields (inherited from the female parent), were of sufficient merit for further trials, though their dry matter content was not as good as that of the parent form owing probably to their vegetation having been interrupted by a period of great heat.

Tobacco.
The director (D. Bailov) of the Tobacco Research Station at Kozareve reports that tobacco selection is in progress and from 8 élites some types of good quality are to be further investigated as they seem likely to produce new and better varieties for the market. Intensive measures are being taken to instruct and interest growers in the best varieties.
Three series of comparative variety trials were conducted in which some selections such as No. 536, No. 54 and No. 543 did well as regards yield and quality.

61. 575:633(47.8)
(Bulgarian Agricultural Association, Sofia —Report on work of the Association during 1938).
Zemledelie, Sofia 1939 : 43 : No. 4 : 1–25.
This report contains the following information of interest to plant breeders engaged in the production or improvement of certain crops:—

Pyrethrum.
The importance of developing pyrethrum as a new crop in Bulgaria has been recognized. Initial studies have shown that by individual and mass selection plants can be obtained with high quality as a hereditary character. Owing, however, to pyrethrum being cross-pollinated, multiplication of new varieties must take place out of range of other plantings, which raises a problem for solution since seed from isolated sowings gives plants in which germination is considerably reduced. In addition to work on the above problems at the Agricultural Research Institute at Sofia, studies of the regional suitability of pyrethrum are being conducted at about 45 centres in northern Bulgaria and in the neighbourhood of Sofia, and these investigations have shown that out of 53 regions in only 3 is the percentage of pyrethrin under 1% and in some the percentage is even higher. The relation between these findings and the environmental conditions is being examined.

Fodder Beet.
Breeding to improve the forage beet "Kirše Ideal" at the Association's Seed Production Farm at the village of Proslav has been proceeding under the direction of Ju. Svekolkin. From fourteen selected lines mother plants with at least 10% dry matter have been used in endeavouring to obtain a form in which the external characteristics of Kirše Ideal are constant and to produce a variety with the highest percentage of dry matter in the different lines and the highest total yield.
On analysis all 14 lines showed a decrease in weight of the root except line No. 433 which showed an increase of 98 grammes. The decrease was attributed to drought. The dry matter content —a feature closely correlated with the root size —showed an increase in all lines.
Seed from these lines will be tested for varietal constancy in the typical external characteristics, weight and content of dry matter and a comparative trial to determine the yields per unit of area has been begun. In spite of certain defects, the experiment shows that lines No. 42 and 43 have given the best yields and seed from these lines will be used to repeat the trial in 1941.
Ten other lines of Kirše Ideal were also undergoing separate trials and of them line 307 has given 350 grm. of seed and line 1625, 310 grm. These two lines were chosen for further selection.
Three Dutch varieties of fodder beet were also included in trials with Kirše Ideal at the Plovdiv Agricultural Experiment Station. The best of the three as compared with Kirše Ideal (= 100) was Rozalite which attained 98·6% as regards root weight and had a dry matter content of 17·4% and of 363·7 kg. (or 105·9%) per dekar [= 0·24 acres].

Tobacco.
Tobacco variety tests and the production of high grade seed for distribution of tobacco are in progress. A number of élite plants from previous years have been selected with the object of obtaining superior varieties of good quality with high yields and élite generations raised. Many of these are of very high quality.
Confirmation of previous findings showing the importance of new varieties of tobacco in improving quality was obtained from variety trials with Ustinski Nos. 1, 4 and 28 and Local Ustinski from the Bega district. No. 28 gave the highest yield and Nos. 1 and 4 the next best. The highest quality was shown by No. 4 which produced 24·8% of tobacco classed in the first three grades (out of a total of 9 grades).

In view of the importance of producing élite seed of new varieties, for distribution to growers, the Kozarska Tobacco Experiment Station has (with assistance from the Bulgarian Agricultural Association) greatly extended its production of seed.

62. B. 575:633(48.5)
Öländsk växtförädling. (**Plant improvement in Öland**).
Lantmannen 1941 : **25** : 443–44.

Barley is the chief cereal of Öland and the production of a variety specially suited to conditions on this Island is an important item in the plant improvement programme. Winter hardiness is an important requirement.
In oat breeding grey spot resistance is one of the main lines of improvement being followed. The cultivation of blue lupins and sweet lupins is being developed and linseed suitable for local conditions is being bred at the Öland Experiment Station.
Early maturing forms of maize have been found suitable for growing on the Island and the extensive breeding operations with maize in recent years in Sweden will also be exploited in Öland.

63. Björkman, T. V. E. 575:633(48.5)
635.655–1.524:575(48.5)
Årsberättelse avgiven den 28 januari 1941. (**Annual report 28th January, 1941**).
K. LantbrAkad. Tidskr. 1941 : **80** : 11–29.

A report by the Royal Agricultural Academy of Sweden.
Research on plant improvement has followed two main lines:(1) the development of the colchicine technique in the production of new polyploid forms—a method regarded as specially promising for fodder crops in which stimulative vegetative growth is important. (2) The utilization of the phenomenon of hybrid vigour which is apparently particularly useful for plants that are to some extent self-fertile but in practice are regularly cross-fertilized.
Research is also in progress on the production of oil plants of suitable types for Swedish conditions. A form of poppy that does not shed its seeds is one of the aims. Work has shown that the soya bean is one of the most difficult crops to adapt to Swedish conditions.
Promising results have also been obtained in growing sweet lupins.
Trials on soils of different acidity have shown that the highly improved varieties of oats and barley in Sweden are superior to more primitive varieties even when grown on relatively poor soil.
Experiments on the cooking quality of peas have been begun.
During the year under review the Academy subsidized an expedition to Eastern Asia to collect soya bean plants for use in breeding experiments.

64. 575:633(48.5)
X. 631.521.5(48.5)
Utsädesbolaget i Svalöf år. Vetenskap och praktik i fruktbärande samverkan. (**The Seed Company in Svalöf-Jubilee—Science and practice in fruitful collaboration**).
Lantmannen 1941 : **25** : 417–18.

Deals with the history and development of the General Swedish Seed Company [Allmänna Svenska Utsädesaktiebolaget] and its work in promoting the distribution and use of new varieties produced by the Swedish Seed Association and other official institutes engaged in plant breeding in Sweden.
During the 50 years period reviewed 162 varieties of various cereals, peas, beans, herbage crops, root crops and potatoes have been released. Most of these are original varieties bred at Svalöf. Their multiplication and maintenance free from admixtures has been an important task of the Company which has also formed a valuable link between the Swedish farmer and the plant breeder, by reporting to the Swedish Plant Breeding Association any criticisms of new varieties by growers.
The production of varieties suited to particular regions (whether small or large) of the country and the development of exports of high quality seed have also been actively promoted by the Company.

65. KIFER, R. S.,
HURT, B. H. and
THORNBROUGH, A. A. 575:633(73)
The influence of technical progress on agricultural production.
Yearb. U.S. Dep. Agric. 1940 : 509–32.

The improvement of crops by American plant breeders is one of the aspects of technical progress considered in this article.

Hybrid maize has replaced open-pollinated varieties on 25% of the maize acreage of the United States, including a major part of the Corn Belt acreage. The resulting increase in yield is estimated at nearly 100,000,000 bushels. The authors expect a tendency to concentrate maize production in the better areas, especially in view of the greater suitability of the lodging-resistant hybrids for harvesting with a mechanical picker. In the absence of control over maize acreage a decline in prices is to be expected.

Rust-resistant wheat, early-maturing grain sorghums, curly-top-resistant sugar beet, cold resistant linseed, longer-stapled cottons and one-variety communities are also briefly considered.

66. WALLACE, H. A. 575:633(73)
Report of the Secretary of Agriculture Washington, December 1, 1939.
U.S. Dep. Agric. 1939 : Pp. 169.

WALLACE, H. A.
Report of the Secretary of Agriculture Washington, September 4, 1940.
Ibid 1940 : Pp. 184.

In the 1939 report very brief mention (pages 129–30) is made of the work of the Bureau of Plant Industry in co-operation with various State agricultural experiment stations in breeding resistant varieties. A short account of the use of colchicine in plant breeding is also given. In the 1940 report some of the achievements of plant breeders in the U.S.A. are mentioned (page 148). Thus in 1940 the rust-resistant spring wheat variety Thatcher was not seriously reduced in yield by rust attack while susceptible varieties were severely damaged in some sections. Approximately 80% of the maize acreage in Iowa and Illinois were planted with hybrids in 1940. It is also, however, pointed out that plant breeding is a long term undertaking and must be regarded as an investment for the future.

67. EASTMAN, M. G. 575:633(74.2)
Agricultural research in New Hampshire.
Rep. Dir. N.H. Agric. Exp. Sta. 1939 (1940) : Bull. No. 319 : Pp. 46.

Beans (Phaseolus).

The variety Gage, with highly coloured seeds but no colour in the pod, was crossed with French Horticultural, having highly coloured pods, but light coloured seed. In the F_2 the desired combination of highly coloured seeds and pods was found and a large number of selections of this type have been made.

Popcorn.

Pinkie, a high popping quality popcorn, has been crossed with White Pearl, a popcorn which is adapted to New England conditions. A wide range of seed colour was observed on the seeds of the F_1 plants.

68. 575:633(74.8)
Science for the farmer.
53rd Rep. Pa. Agric. Exp. Sta. 1940 : Bull. No. 399 : Pp. 76.

Oats.

Promising smut resistant oat strains have been bred by C. F. Noll from the cross Albion x Red Rustproof and from crosses with the smut-resistant variety Markton.

Peppers.

C. E. Myers is engaged in the selection of peppers, including testing of selections in the seventh generation of the cross California Wonderbell x Harris Earliest. The plants varied greatly in the posture of the stamens, some having them incurved, others widely spread. The former were mostly self-pollinating and gave more uniform progeny.

Rhubarb.
Both commercially promising types and unusual types such as dwarfs have been bred by C. E. Myers. Locally produced varieties and a large number of seedlings were under observation or test in 1939.

Lettuce.
Some promising strains have been selected from the cross between Hanson and New York.

Tomatoes.
Progress has been made by C. E. Myers in the development of an early variety which under central Pennsylvania conditions is superior to all others tested in earliness, freedom from blemishes, evenness of colour, fruit structure and yield.
Some selections from the crosses between Penn-State Earliana and Delicious and between Oxheart and Penn-State Earliana were superior to the parents in the above mentioned characters. Further crosses have been made.

Soya Beans.
Varieties, selections and cultures from natural crosses are under test.

Sweet Corn.
In tests of hybrids and varieties eight locally produced hybrids proved outstanding.

69. CONNER, A. B. 575:633(76.4)
52nd Annual Report of the Texas Agricultural Experiment Station.
1939 : Pp. 304.

Plant Insecticides.
Studies on the seasonal and annual variation in the rotenone and total extractive content in the roots of individual plants of *Tephrosia virginiana* were continued. No outstanding differences were noted during the growing season, but the rotenone and total extractive content is much increased in the second year. It has been found possible to obtain normal sets of seed on caged plants by using washed bees of the family *Megachilidae*. Inheritance studies are being continued. More than 5% rotenone has been found in certain plants.

Wheat.
Rust-resistant selections from Hope x Mediterranean have reached the increase stage. The two most productive have performed well in milling and baking tests. Strains from this cross have also been crossed with commercial winter wheat varieties to develop rust-resistant strains for North Texas and other states; several hundred selections are being tested at College Station.
Co-operative tests of resistance to leaf rust and stem rust are performed.
The seedling immunity to all forms of stem rust found in certain Kenya wheats and McMurachy is being combined, on the one hand, with the mature plant resistance and winter habit of Hope x Mediterranean selections and, on the other, with the resistance to stem rust, leaf rust, loose smut and bunt of strains derived from crosses of Hope with Martin, Ridit and White Odessa.
At substation No. 6, Denton, breeding work to introduce leaf and stem rust resistance into the new Hope x Mediterranean commercial back-crosses has made good progress. Another programme aims at the transference of resistance to loose smut to commercial varieties and new strains. Martin x Tenmarq C.I.11503, a station selection, has high resistance to bunt and yields as well as Tenmarq.
The spread and occurrence of physiological forms of rust are studied in autumn and spring sown U.S.D.A. rust nurseries.
In studying the influence of awns on yields it has been found that awned segregates of a cross yield more at three localities, the increase being greater in the west. Other studies are on lodging and on shattering.

Oats.
Two strains from the cross Nortex x Victoria, combining resistance to crown rust with winter habit and good grain type are being increased for distribution. Selection for resistance to both stem and crown rust is in progress.
At substation No. 6, Denton, the development of strains resistant to both rusts and smuts continues.

Maize.

Extensive tests have shown that Corn Belt hybrids cannot be recommended for Texas. Some of the inbreds used in these hybrids, however, have been crossed with the variety Yellow Surcropper and will be back-crossed to the inbred parent to produce modified strains suitable for use in Texas. Two inbred strains of Mosshart Yellow Dent, 127C and 132A, which have performed well in top-crosses with Yellow Surcropper have been increased and will be grown on seven acres for crossing in 1940. The single cross between these two lines can be used to pollinate Yellow Surcropper and produce a top cross yielding 35% more than Yellow Surcropper. New inbred strains of Yellow Surcropper and Golden June are being isolated for combining with these strains.

The inbred strains of an excellent double cross of white maize are being multiplied.

Cytogenetic data have been found supporting the hypothesis that Guatemalan teosintes represent the primary products of hybridization of *Zea* with *Tripsacum*, that the Mexican teosintes are secondary or tertiary products and that the Andean region is the primary centre of domestication of maize.

At substation No. 3, Angleton, the variety Yellow Tuxpan has been greatly improved in type by a method of inbreeding and top-crossing, while at substation No. 6, Denton, the colour of Yellow Surcropper has been improved by a similar method. A yellow prolific variety is being developed at substation No. 10, College Station, by a similar method and further work is being done to advance the maturity and reduce the height of stalk of Texas Golden Prolific.

Barley.

At substation No. 6, Denton, smooth awns and greater disease resistance are being transferred to the new, high yielding variety Wintex.

Sorghums.

The work on Sudan grass has already been reviewed (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 1011).

The development of Blackhul kafir and Yellow milo varieties having sweet stems and higher forage value is nearing completion. Yellow pericarp colour is being incorporated into varieties of hegari, kafir and feterita and palatable white- and yellow-seeded varieties of sorgo resistant to leaf spot diseases are being bred. Early hegari, a 15-days earlier mutant of hegari appears to be a valuable addition to the list of varieties grown in Texas.

Studies on the inheritance of time to flowering in a number of crosses have shown that in some cases a difference of only one gene is involved. It is believed that a few major genes affecting physiological characters are responsible for the major varietal differences found in sorghums and for the hybrid vigor occurring in certain crosses.

Breeding work with broom corn is carried on at substation No. 1, Beeville, the variety Texas Scarborough Dwarf undergoing selection. Spiking of the heads has been shown to be due largely to environment.

At substation No. 2, Tyler, an improved strain of Texas Seeded Ribbon Cane has been selected and should be available for limited distribution in 1941.

The isolation of strains of dwarf yellow milo resistant to milo blight, *Pythium arrhenomanes*, was continued. Combine types were selected for testing from kafir-milo and hegari-milo crosses. Other selections under test or to be tested include two very early, yellow seeded hegari-milo strains, sumac-kafir selections corresponding to Dwarf Kafir in height and maturity but with sweet, juicy stalks and various Red Kafir—Hegari selections. No progress was made in selecting for resistance to charcoal disease, *Sclerotium bataticola*.

At substation No. 12, Chillicothe, strains of most of the important varieties resistant to *Pythium* are available for distribution. In the work on utilizing hybrid vigour ten foundation lines have been produced which carry male-sterility linked in coupling with a virescent yellow character and presence of awns, enabling the non-male-sterile plants to be eliminated before blooming. A large number of crosses using these lines has been made. In inheritance studies, four linkage groups are now known and two new lethal chlorophyll characters have been discovered.

Rice.

Breeding work is in progress at substation No. 4, Beaumont, hybridization and selection being used in the development of early, midseason and late types, attention being paid to resistance to *Cercospora oryzae* and *Helminthosporium oryzae* and to quality of grain. The inheritance of date of heading and other characters is being studied.

Cotton.

In studies on the inheritance of fibre fineness, involving crosses of Hopi cotton with commercial upland varieties, crosses of Acala and Delfos with Hopi continue to show the greatest promise with respect to yield and quality.

Lintless and sparse-linted types have been crossed with commercial upland varieties with the object of obtaining desirable recombinations higher in seed and oil production than the standard commercial varieties. The inheritance of the character boll apical furrow is being studied.

Extremely hairy types with high yielding qualities have been recovered from crosses made in studying the inheritance of the hairy condition of the cotton plant. They will be used in the breeding programme to develop high-yielding, hairy types of cotton which retain insect poisons better than ordinary varieties.

By back-crossing, lines differing by only a single gene in the four gradations of leaf shape and leaf colour have been isolated. They will be used in a study of the effect of leaf shape and colour on yield.

It has been concluded that a single factor pair *N-n* controls both lint and fuzz. *NN* plants are devoid of fuzz and when modifiers for lint are absent also lack lint. *Nn* plants have nearly normal lint and only a trace of fuzz, *nn* plants being normal. Plus modifiers produce lint on naked (*NN*) seeds and it is proposed to combine as many as possible into one genotype which will then be combined with some of the better stocks carrying the major gene *n*.

The possibility of using F_1 *Gossypium barbadense* x *G. hirsutum* for the commercial production of cotton with a staple of $1\frac{1}{2}$ inches or longer is being investigated. An average of 9% natural crossing has been obtained when the two types were planted together in a locality known to have large populations of certain Hymenoptera.

Interspecific crosses have been and are being made to study the practicability of transferring desirable characters of *G. barbadense, G. purpurascens* and related species to good Upland stocks. A similar study has been started in which desirable characters will be transferred to Upland stocks from new species synthesized from certain Asiatic and wild species.

Polyploids have been produced from *G. hirsutum* (n = 26) x *G. anomalum* (n = 13) and *G. arboreum* var. *neglectum* (n = 13) x *G. anomalum*. At meiosis in the former hybrid an average of 8 pairs was observed, bridges being formed at anaphase. Structural chromosome differences were also detected in the latter hybrid. Haploids have been found in the varieties Acala and Stoneville and several haploids of *G. hirsutum* and *G. barbadense* have been irradiated with X-rays to induce gene mutations and chromosome mutations. The Rural Home Research section is studying the fibre properties of Lightning Express, Half and Half and different generations of the cross between them.

At substation No. 8, Lubbock, three lines of breeding are being followed: an early strain is being selected for use in years when late planting is necessary; a stormproof selection is being developed for mechanical harvesting and thirdly a strain to be grown for seed-crushing only is being developed. The storm-proof selection has a short staple and has been crossed with longer-fibre varieties. The lintless strain of Cleveland found in 1936 has been used in crosses with the object of finding a strain with sufficient lint to prevent wasting of the seed. Breeding cotton for mechanical harvesting is also being studied at College Station. Medium staple varieties with coarser fibre and compact boll type gave the cleanest lint and varieties with small, compact plants and large, storm-resistant bolls were the easiest to harvest. Crosses were made in 1939 with the object of producing strains for mechanical harvesting. Western Early, Ducona x Lone Star and Ducona x Half and Half have shown promise in harvesting trials.

Cotton breeding work at Nacogdoches (substation No. 11) is mainly concerned with the selection from the cross Half and Half x Lone Star of high-yielding types equal in fibre properties to Lone Star.

At substation No. 12, Chillicothe, the purity of Western Mebane 140 and 141 is being maintained by progeny row selection and selections are being made in the progeny of the cross Lankart x Mebane.

The effects of inbreeding on uniformity are being studied at substation No. 6, Denton, where two exceptionally good strains of Sunshine cotton have been produced.

Plum.

The variety Munson was pollinated by Wickson, Duarte, Becky Smith and the native species

Prunus mexicana and *P. texana* and seed was obtained from all crosses. Only one seed was obtained from 600 pollinations using chiefly pollen of Munson and *P. mexicana*.

Peach.
Seedlings of the cross Hiley x Pallas which flowered during 1939 had very moderate cold requirements and were all productive, white-fleshed early freestones as expected. Some had the sweet flavour characteristic of the Honey type, the others were very mild to mildly sub-acid.

Citrus.
The pollen of the grapefruit varieties Marsh, Little River and Ruby is about 16% viable, that of Duncan and Foster nearly 90%. In different varieties of oranges pollen viability ranges from 35 to 80%. The tangelo (grapefruit x tangerine) has 93% good pollen. The Cunningham citrange produces 17·1% of aberrant chlorophyll seedlings of different types. This is not due to normal segregation as several abnormal seedlings may be obtained from one seed. Though most species and varieties of *Citrus* have been found to be diploid (2n = 18) a triploid seedling has been found in the progeny of the Thornton tangelo open-pollinated and a tetraploid in that of Sampson tangelo open-pollinated.

Figs.
Intervarietal and interspecific crosses were made in 1939 at substation No. 3, Angleton and the cross *Ficus nota* x Hamma was made in Florida using Hamma pollen sent from Texas. Edible fruit was produced on seedlings from crosses made in previous years, most of them from Magnolia x Hamma. None was particularly outstanding and no seedlings have so far produced capri figs. Viability of fig pollen can be extended from about 5 days to over two months by storing at 50° F. provided it is put into storage within one day of being gathered.

Peanuts.
The cross Macspan x Virginia Bunch was made in 1937 to combine the fine eating qualities of Macspan with the dormancy of Virginia Bunch. Sown in the field in 1939 and left six weeks after maturity to eliminate sprouters, practically all the non-sprouting seed was eaten or damaged by rodents. It may be necessary to make the cross again.

Papaya.
At substation No. 15, Weslaco, breeding work is in progress. Crosses between and within families were made and data on the fruits recorded.

Rubus.
At the Main Station superior seedlings of the back-crosses of Nessberry to dewberry and raspberry have been selected. In the back-cross to the dewberry the type of fruit and habit of growth of the dewberry are dominant. In the back-cross to the raspberry the plants resemble the Nessberry rather closely. The greatest variation in both crosses is in flavour.
At substation No. 11, Nacogdoches, the inbreeding of varieties and hybrids was continued and intervarietal crosses were made between the varieties Young dewberry, Crandall's Early and Hall's Lawton blackberry. About 4,500 seedlings are under observation. Many two-year old seedlings yielded heavily but lacked the desired quality of fruit.

Strawberries.
A group of 3,300 seedlings having the seedling T68 as pollen parent was studied. Most of them stand the heat well and many have the deep red colour of T68. From the 1938 crosses 277 selections are under study.

Grapes.
Seedlings raised by self-pollination and by crossing are under observation.

Oaks.
The crosses *Quercus virginina* x *Q. lyrata* and *Q. virginiana* x *Q. serrata* have been made and *Q. virginiana* x *Q. texana* attempted without success. Hybrid seedlings from the 1938 crosses have been established.

Onions.
Breeding work at substation No. 19, Winter Haven, is making slow progress and in the hope of speeding it up dormancy-breaking treatments are being investigated. Wounding alone and combined with cold storage were the most successful. Resistance to thrips and pink root (*Phoma terrestris*) are among the objectives of selection work.

Brassicae.
A tendency for the Marion Market cabbage to develop a more elongated head when grown in lower latitudes is tentatively attributed to the influence of length of day. This emphasizes the importance of local adaptation in breeding new varieties. Selection work is in progress with broccoli and collards, the aim with broccoli being large, desirable heads on smaller plants and with collards uniformly dark green-, sessile-leaved, low, compact plants. Colchicine has been used on Copenhagen Market cabbage in attempts to double its chromosomes, with the object of securing increased winter hardiness. Concentrations of 0·2, 0·1, 0·05, and 0·025% were about equally effective, 0·0125% much less so. Repeated treatment seemed more effective than single treatments. Some of the shoots produced under the action of colchicine have been found to have tetraploid (2n = 36) roots.

Cantaloupes.
In the breeding work at substation No. 19, Winter Haven, the objects are good eating and shipping qualities combined with resistance to downy mildew (*Peronoplasmopara cubensis*) and other diseases. Inbred lines showing resistance to downy mildew and powdery mildew (*Erysiphe cichoracearum*) and to melon aphid have been obtained. Some of them have been crossed with commercially desirable strains and promising experimental hybrids produced.

Tomatoes.
A strain of Earliana showing resistance to southern blight (*Sclerotium Rolfsii*) has been found and two selections from a cross involving Earliana showed some resistance. Several crosses show improvements in adaptability, combining better quality fruit with earliness and high yield. One selection produces fruit of excellent colour at high temperatures.
Break O'Day was crossed with J.T.D. for possible heterosis and further crosses were made for breeding work. Further selection of Summerset is giving a somewhat larger and more uniform late fruit for production in south-west Texas under irrigation.
In extensive tests of wilt resistance (*Fusarium lycopersici*) at the Tomato Disease Laboratory, Jacksonville, four selections from Bohn-Tucker crosses were found to be immune. Genetical studies have shown white flowers (*y*) to be recessive to yellow (*Y*). A new mutant with sticky fruits has been discovered and another with yellow-bordered leaves occurred in Marglobe seed treated with X-rays.

Peas.
Three crosses were made during 1939. Seed of Creole peas grown in Texas in 1938 was sown alongside the original seed in 1939 and yielded 8·38 grm. per plant as against 6 grm. from the original seed. It is suggested that this may be due to natural selection. Colchicine studies were started with the variety Thomas Laxton, using plants 6 to 8 nodes high. Seeds have been obtained from affected areas.

Sweet Corn.
Yellow-seeded inbred lines were isolated from crosses of P39 and P51 with various Texas sweet corn varieties and tested. Some of them are quite vigorous, resistant to ear worm damage and of excellent quality.

70. Walker, R. H. 575:633(79.2)
Research aids Utah agriculture. Biennial Report 1938–40.
Bull. Utah Agric. Exp. Sta. 1940 : No. 294 : Pp. 119.

Wheat.
Winter wheat selections with a high degree of resistance to all known races of covered smut have been obtained from the cross Relief x Ridit. One selection increased for distribution was found to be susceptible to shattering, a tendency derived from Relief. Some sister selections, equally resistant, are free from shattering.
A spring wheat selection from Federation x Hope is to be distributed for trial in 1941. It is resistant to all races of bunt, to loose smut and rust.

Stone Fruits.
Over 13,000 seedlings of apricots, peaches, cherries and plums have been propagated and are growing in the nursery greenhouse and seedling orchards. Hardier varieties are being sought.

Tomatoes.
Breeding a variety resistant to wilt caused by *Verticillium alboatrum* R. and B. is in progress. No more than moderate resistance has been found in any commercial variety, but a degree of

resistance approaching immunity has been found in the red-fruited wild tomatoes *Lycopersicon esculentum* var. *cerasiforme* (Dun.) Gray and *L. pimpinellifolium* (Jusl.) Mill. and in the green-fruited *L. glandulosum* C.H. Mul. The red-fruited types cross readily with commercial varieties and from the cross of var. *cerasiforme* with the varieties Stone and Century third generation hybrids with fair fruit size and high resistance are under test. They are also being back-crossed to the commercial tomato.
The Californian varieties Essar and Riverside are being reselected with a view to improving their wilt resistance and shortening their growing season.
Extensive tests of resistance to the curly top virus disease, transmitted by *Eutettix tenellus* Baker, have disclosed resistance in a Mexican wild tomato Ojo de Venado and in a dwarf selection of the novelty tomato Red Peach. These have been reselected to increase their resistance and used in crosses with commercial varieties. The F_2 and F_3 generations of these crosses have all been lacking in resistance and fruit quality. Further crosses and back-crosses are being made. More recently a higher degree of resistance has been found in the green-fruited types *L. glandulosum* C.H. Mul., *L. peruvianum* var. *humifusum* C.H. Mul. and *L. peruvianum* var. *dentatum* Dun. Repeated attempts to cross these with commercial varieties have failed but it is hoped that *L. hirsutum* H.B.K. will serve as a bridge species.

Beans (Phaseolus).
Selections of white pea bean and pinto bean resistant to curly top have been developed. They are susceptible to bean mosaic and are being selected for resistance to this virus disease.

71. 575:633(79.7)

50th Annual Report of the Washington Agricultural Experiment Station.
Bull. Wash. Agric. Exp. Sta. 1940 : No. 394 : Pp. 124.

Ustilago.
No new races of oat smut (*U. levis* and *U. avenae*) were identified. Seven races of buff smut have resulted from mutation and hybridization. Powdery sori in *U. avenae* are controlled by a single factor, dominant to that for indurate sori. F_1 spores have been produced from the crosses of several collections of *U. bullata* (head smut) with *U. nigra*, *U. hordei* and *U. striaeformis*. These spores do not germinate normally and very little success has attended efforts to continue the work beyond the F_1.

Tilletia.
Three additional races of *T. tritici* and two of *T. levis* have been established, making a total of 14 of the former and 10 of the latter. Race and species hybrids of *Tilletia* give rise to some races which are equal in virulence to one parent, some which are less virulent than either, some which have the combined virulence of both and some which have a virulence not possessed by either parent. Segregation for smooth and reticulate spores has been observed in species hybrids but no definite F_2 segregation ratios have been determined. Dwarf smut has been crossed with other races of *T. tritici* and *T. levis*.

Wheat.
The inheritance was studied of resistance to the bunt races L_8, which attacks Oro, and T_{11} which attacks Turkey-Florence. Analysis of F_1, F_2, F_3 and F_4 material suggests that three factors are involved in resistance to T_{11} and two for L_8. Some of the F_3 lines carry all five factors.
Some of the heavy grained selections of Baart made in 1938 produced heavy grains in 1939 and 1940 and high yields in 1940.
Varieties and selections are tested for resistance to bunt, mildew, stem rust and leaf rust. The cross Hope-Kavale x Brevon was made to combine short, stiff straw, non-shattering, high yield and resistance to three rusts, mildew and smut.
In attempting to develop a winter-hardy wheat as prolific as Triplet but resistant to smut and with glabrous glumes, 300 selections of Ridit x Triplet F_2 and F_3 seed were inoculated with four virulent races of bunt for further selection.

Rye.
The hybrid *Secale cereale* x *S. montanum* is being improved for longevity by natural selection.

Grasses.
Inheritance studies were concerned with parent-progeny relationships as to vigour and fertility in both self- and open-pollinated material.
Hybridization of grasses and cereals was continued. Rye and wheat crossed with *Agropyron intermedium* and *A. trichophorum* gave completely sterile hybrids. Rye crossed with *A. repens* and *A. sibiricum* also gave sterile hybrids. Fertile segregates, some of them perennial, have been derived from crosses of wheat with *A. elongatum*. Hybrid progenies are under investigation from crosses of Prolific, Dakold and Rosen ryes with *Secale montanum*.

Lucerne.
The breeding work includes a genetic study of flower colour, pod characters, habit of growth and pigmentation of the stem.

Potatoes.
Promising seedlings mentioned are 1892 (Katahdin selfed), 3708 (Katahdin selfed), 2984 (Katahdin x 1185), 4548 (Keeper selfed) and 6361 (Houma x Katahdin).
Seedlings are tested for virus-resistance.

Raspberries.
Over 2,000 seedlings from the 1938 crosses were tested in the greenhouse for resistance to *Amphorophora rubi* Kalt., the aphid vector of red raspberry mosaic. Some 1,300 plants on which the aphid would feed were discarded. In the breeding plots 53 new selections were marked for further testing.

Strawberries.
The testing of varieties and hybrid selections for resistance to blackroot was continued. A total of 1,886 seedlings, representing 25 crosses, were planted in a field infected with blackroot.

72. Schelotto, B. 575:633(82)
Informe anual correspondiente al año agricola 1940–41. (**Annual Report for the year 1940–41**).
Bol. Chacra Exp. "La Previsión" 1941 : **3** : 59–111.

Data are given showing the relative productivity of a number of wheat varieties under test, the best of which have proved to be La Previsión 25 and Eureka. Brief descriptions of the varieties tested are given. Observations have been made on the reaction of the varieties to artificial infection with *Tilletia* spp. and a form possessing a high degree of resistance has been selected (La Previsión 143/34). A resistant form of *Triticum durum* has also been selected.
Data are given on the yields of varieties and new hybrids of oats and barley after grazing. The best results were given by the yellow oats, the best of which was a hybrid La Previsión 13 x Klein–Mar 26 4–5, followed by a new selection of La Previsión 13 and various other hybrids of it with Klein–Mar and Klein Victoria. The white grained forms were all inferior.
The best among the barleys were F.M.85 and a new hybrid Sel. II–13 x Common Forage–7–2.
The only variety possessed of resistance to *Ustilago hordei* was Forage F.M.85.
In linseed the highest oil content was given by a selection Malabrigo 4–3/35 but La Previsión 18 showed the best combination of yield and oil content. Variety tests have also been carried out with sunflower, the relative yields, husk percentage and oil content being reported.

73. 575:633(85)
Memoria de la Estación Experimental Agrícola de La Molina, correspondiente al año 1939. (**Report of the Agricultural Experiment Station of La Molina. Report for the year 1939**).
Lima, Peru (1939) 1940 : No. 12a : Pp. 371.

Cereal Genetics Section.
Individual plant selections have been made in quinoa (*Chenopodium Quinoa*) and data are given regarding characters such as height, colour of inflorescence, vegetation period and yield. The lines were found to be more uniform than in the previous years. Similar observations have been made on selections of cañahua (*C. pallidicaule*).
Wheat variety tests have shown Mentana to be the best variety, being very resistant to rust, especially *Puccinia graminis tritici*. The variety Sin Nombre, an individual plant selection from Marquis is also promising; it is resistant to *P. glumarum*, high in hectolitre weight and is adapted to the poorest lands.

Oat varieties have been tested and L.W.P.–131 has proved the best, being resistant to stem rust.
Variety tests have also been continued with barley and with sugar cane.

Cotton.

Valle de Lima Section.

Statistical studies have been made in the best Tangüis selections on the following characters: lint length, weight of 100 seeds, lint percentage, lint index, weight of raw cotton per boll, weight of lint per boll, number of seeds per boll, earliness and weight of raw cotton per plant. Correlation coefficients have been calculated between lint percentage and length, weight per 100 seeds and lint percentage and weight per 100 seeds and lint length. This method has been used as a purity chequer to compare the relative purity of the selections with the original material from which it was selected. The results indicated the undoubted superiority of the selections over the ordinary unselected Tangüis. Selections Cñ–LM 7–35 and Cñ–LM are superior in lint length and quality, in uniformity and in earliness. Type P is inferior to the above selections in lint qualities but is extremely early. Type C is inferior to the others in nearly all characters except yield. Type CB is superior in lint length and quality but is very prone to shedding. Selection is being continued and the different types are being intercrossed.
Reports of spinning tests made by the Shirley Institute on the selections P–LM, Cñ–LM, C–LM and Cñ–LM 7–35 are presented. The strongest proved to be Cñ–LM 7–35 and Cñ–LM, while P–LM is the weakest. In appearance Cñ–LM was better than Cñ–LM 7–35, which was more neppy, and in general Cñ–LM was pronounced the most satisfactory. Seed of the latter variety is however being multiplied rapidly for distribution to each cotton growing valley, so that it can be studied in every possible eological environment.
Wilt (*Verticillium*) resistance has been studied in the progenies of 78 plants that had proved free from attack and in 38 lines found to be tolerant—i.e. in which a late attack produced no signs of damage or reduction in yield. Observations were also made on 289 lines of Giza 7 and on Cñ–LM 7–35, Pima, S x P, Miller and Dixie 14–5. This year 16 progenies of the 1937–38 selections and 10 of the 1938–39 have been selected. Figures are given showing the material reduction in the percentage of attack in each successive year of selection. Though no lines immune to *Verticillium* have yet been found, the discovery of the tolerant Tangüis lines has to all intents and purposes solved the problem in practice. Selection is now carried out by selfing the plants which suffer the minimum attack at the "critical period" of the fungus and then selecting the seeds from those plants which at the end of the season show the least signs of damage. In this way 378 plants phenotypically immune have been selected and their progeny will be studied in later years. All the other varieties referred to above proved entirely susceptible.
The progenies of a number of crosses have been studied and many of the hybrids have been pronounced extremely promising from the practical point of view. Details will be published elsewhere.
The second generation from plants treated with X-rays in doses from 200 to 800 r, with exposures varying from 3·5 to 15 minutes showed no signs of recessive mutants.
The terminal buds of hybrids of Tangüis x Acala have been treated with 0·5% colchicine solution and the seeds produced are being studied.
A cytologist has been appointed and investigations are being made on the different types of Tangüis, especially the cleistogamous type, and on the F_1 and F_2 generations from plants treated with colchicine, on the wild Peruvian species *G. Raimondii* Ulbr. and on its hybrid with *G. hirsutum* (var. U4). This hybrid is sterile and has proved to have $2n = 39$.
The cotton collection has been further extended and now contains 416 specimens.

Valle de Piura Section.

Further observations in 1937 on the selections A^{I}, A^{II}, B and C have proved the superiority of the A types and the marked inferiority of the C. The A types showed the first flowers 60 days after sowing, the B 57 days and the C 65 days.
B is distinguished by low shedding, is the only one to combine increased number of fruiting branches with increased index of insertion of the first fruiting branch (earliness) and number of flowers. Sub-type A^{II} is similar to B except for a higher percentage of shedding.
Self-pollination was effected on 352,062 flowers of Pima and other varieties.
Among the 1938 individual plant selections there appeared a new form, selection 182–37,

characterized by pubescent stem, branch and leaf, more vigorous and later than Pima. Its progeny, consisting of 36 plants, was heterogeneous in many respects and has been referred to as type P. Type C has been finally discarded.

Data are presented on plant and fibre characters of the four types A^{I}, A^{II}, B and P.

1939 observations showed that in the A^{I} type the leaf index is larger, the length of the internodes greater, and the total shedding percentage less; the number of reproductive organs was greater in the selections, this combined with the reduced shedding indicating a much higher adaptation to the environment. In 1939 a total of 164,344 flowers were self-pollinated. Selections A^{I} 17–39 and A^{II} 80–39 have proved definitely superior to the unselected types; data on boll and fibre characters for types A^{I} and A^{II} are presented.

74. BEAUMONT, J. H. 575:633(96.9)
Report of the Hawaii Agricultural Experiment Station.
1940 (1941) : Pp. 94.

Taro.
The specific gravity method of measuring starch content was tested for taro corms and a highly significant linear regression coefficient of percentage starch on specific gravity was found.

Macadamia.
Seedlings have been planted in a chlorotic area and in sand cultures and their chlorotic reactions observed. Two trees produced green seedlings in such numbers as to appear resistant to chlorosis.

Papaya.
Studies on the genetics of sex inheritance have been brought to completion. Four types of tree are now recognized—female or pistillate, fully-fertile hermaphrodite, summer-sterile hermaphrodite and male or staminate. The sex expression of each type is probably determined by closely associated genetic factors which are inherited as simple Mendelian units. One quarter of the seeds from hermaphrodite and male trees are non-viable. Each sex type is subject to modification by physiological influences.

Tomato.
Selection for resistance to spotted wilt is in progress.

Snap bean. Pole varieties.
Selections combining desirable commercial characters and rust resistance were made in the F_2 of a cross between the Kentucky Wonder rust-resistant brown-seeded variety and the rust-susceptible, flat podded variety Lualualei.

Sweet corn.
All the breeding material at the station, including open-pollinated and self-pollinated U.S.D.A. 34 lines and crosses, was tested for tenderness of pericarp by the resistance to puncture method. It appears to be possible to select types with more tender pericarps.

75. NEBEL, B. R. 575:633:576.356.5
Symposium on "Theoretical and practical aspects of polyploidy in crop plants". Introduction.
Amer. Nat. 1941 : **75** : 289–90.

This is the introduction to a symposium held at the meeting of the American Association for the Advancement of Science in January, 1941. Three of the four papers read at this symposium are abstracted in this number of "Plant Breeding Abstracts" (see Absts 76, 112, 209). The other paper was "Induced polyploidy in floriculture" by S. L. Emsweller and M. L. Ruttle, with discussion by H. E. White.

76. 575:633:576.356.5
RANDOLPH, L. F. 633.15:576.356.5:581.162.5
Symposium on "Theoretical and practical aspects of polyploidy in crop plants". An evaluation of induced polyploidy as a method of breeding crop plants (with discussion by G. M. Darrow).
Amer. Nat. 1941 : **75** : 347–65.

It is pointed out that many of our cultivated plants are already polyploids and that further reduplication of their chromosomes is more often detrimental than beneficial. The fertility of autotetraploid maize is considered in some detail. Tetraploids produced from open-

pollinated varieties and hybrid stocks are more highly self-fertile than those produced from inbred lines. Both "sterile" and "fertile" lines have been obtained by inbreeding tetraploids from hybrid diploid stocks. Meiotic irregularities are no more prevalent in the sterile than in the fertile lines and the cytological evidence suggests that the irregularities will only account for 5–15% reductions in fertility. Higher amounts of self-sterility must therefore be due to other causes. Although the reduction in fertility that characterizes most experimental autopolyploids is an important limiting factor in their practical utilization, their superiority in other characteristics may in certain cases outweigh the deleterious effects of reduced fertility. Among these other characteristics chemical composition is very important. Thus certain lines of tetraploid maize give a corn meal of protein content 5-20% higher than that obtained from diploids. More studies on the chemical composition of diploids and related tetraploids would be useful to plant breeders. It is also suggested that heterosis in a tetraploid should persist for more generations than in a diploid. Finally the problems connected with contamination of a tetraploid stock are considered.
A few problems in the use of induced polyploidy in the breeding of *Rubus*, strawberries and blueberries are considered in the discussion.

77. KUGLER, W. F. 575:633:608.3(82)
Amparo a la propiedad en la creación de nuevas variedades de plantas—Antecedentes en el país y en el extranjero. (**Ownership protection for breeding new varieties of plants. Local and foreign antecedents**).
"Granos" Semilla Selecta, B. Aires 1939 : **3** : No. 11 : 3–20.

In tracing the progress of wheat breeding in Argentina, the introduction of high yielding wheats of low quality is shown to have been an important factor in the wheat crisis and the great financial losses of the growers; legislation was undertaken in 1935 to control the introduction and sale of new varieties. Recently attempts have been made to introduce a plant patent law, which would enable new varieties of proved merit to be patented. The terms of the proposed law are described and compared with the position in other countries.

GENETICS 575.1

78. 575.114:575.3:635.656
*KHAČATUROV, S. P. 575.114:575.3:633.11
(**Differences in the progenies of hybrids**).
Jarovizacija 1940 : No. 6 (33) : 29–44.

Nine pods were obtained in 1937 from the pea cross Early Green No. 1760 x Yellow No. 2524. The seeds from each pod were sown separately and gave 42 F_1 plants. The pods from each plot were gathered separately and it was found that some plants bore only yellow seeds; in others the percentage of yellow seeds varied from 64·8% upwards. The seeds of each F_1 plant were sown in separate plots and the results are given in the tables in the appendix. 40·6% of the families (F_3) contained only yellow seeds, 20·6 contained only green and 38·8% were mixed; these latter contained varying proportions of green and yellow seeds, some having almost all yellow seeds, some almost all green, others varying intermediate proportions. The figures showed marked deviations from the Gauss law, as many as 56% of families having deviations greater than 1, and 23% greater than 3.
The awned semi-winter wheat Azerbaijan No. 17019 was pollinated with two awnless spring wheats Red Fife and Garnet. The progeny of each F_1 plant was sown separately. The individual families differed in regard to tillering, vigour, height of plant, number and size of leaves, shade of green and a number of other characteristics. The plants within each family however showed a marked resemblance to one another. At maturity some families were entirely awned, some almost entirely awnless, others were mixed. There was a tendency for awned plants to appear together in groups in the plots, other groups comprising almost exclusively awnless plants.

79. SENGBUSCH, R. v. 575.12:575.14:633:578.08
Pärchenzüchtung, unter Ausschaltung von Inzuchtschäden. (**Breeding with pairs, while excluding injury from inbreeding**).
Forschungsdienst 1940 : **10** : 545–49.

In this article the various problems that arise in breeding cross-pollinated plants and the technique best adapted for such work are treated in greater detail than in the author's book on

* An extended summary of this paper is on file at the Bureau.

"Theory and Practice of Plant Breeding" and some new improvements, based on experience, are suggested.

The author advocates a system of breeding in which numerous pairs of selected plants phenotypically of the desired type are crossed and their progeny, if judged satisfactory on their performance, used for hybridization of further pairs. This process if continued should ultimately produce a uniform type as regards performance, without danger of injury from inbreeding.

Other important points dealt with are the different technique required in dealing with plants whose merits are apparent before fertilization and those whose value is not apparent till after pollination (e.g. hemp, rye). An elaboration of his method has been devised by the author which should permit the breeder to form some idea beforehand of the potential value of certain combinations when crossed.

The question of the numbers of crosses of pairs required to guarantee success is discussed. For rye the number 10,000 is suggested as a minimum. Suggestions are also given for the actual technique of making the crosses and laying out the experiments.

Since 1937 the author himself has been using the crossed pairs method and in view of its well founded theoretical basis, regards it as certain to lead ultimately to success.

80. Piza, S. de Toledo (jun.) 575.17
Bases para uma futura compreensão dos cromossômios. (**Basis for a future understanding of the chromosomes**).
Rev. Agric., S. Paulo 1941 : **16** : 104–17.

The author concludes that the genes as particles do not exist, the chromosome functioning as a whole, being endowed with a polarity which accounts for translocation and position effects. The action of the chromosomes is regarded as secondary to that of the cytoplasm, which is responsible for all the more important characters and controls the influence of the chromosomes even on the rest.

81. Fröier, K. and
Gustafsson, Å. 575.243:537.531:633.1
The influence of X-ray dosage on germination and sprouting ability in barley and wheat.
Svensk Bot. Tidskr. 1941 : **35** : 43–56.

These experiments (made in collaboration with the Radio-physics Institute, Stockholm) form part of a genetical, cytological and physiological attack on the problem of the simultaneous influence of X-ray dosage on mortality, sterility, chromosome disturbances and the frequency of lethal and viable mutations.

The effect of X-ray dosage upon germination and sprouting was studied in Maja, a high yielding spring barley, and in Skandia III, a high yielding winter wheat.

It was found that water content of the seed, being related to its metabolic activity, is also an important factor in seed mortality, chromosome disturbances and mutation rate. Studies of the variation in water content in wheat, barley and oats have therefore been made and the results are discussed in relation to the mortality curves in oats and barley.

The grain of Skandia III with 16·0% of water was killed by X-ray dosages over 25,000 r.; on the other hand some grains of Maja barley with a water content of 13·8% survived after doses of 30,000 to 45,000 r. units, though most of the seed died after 25,000 r.

Hexaploid oat grains containing 13% of water will survive even 50,000 r. Hexaploid cereals in general are more resistant than diploids to X-rays but in this resistance the structure of the caryopsis and its actual water content are important secondary factors in addition to the hexaploidy.

Further research on nuclear inactivation in relation to metabolism and X-ray dosage must be conducted.

82. *Avakjan, A. A. and 575.257:635.64
Jastreb, N. G. 575.257:633.491
(**Hybridization by means of grafts**).
Jarovizacija 1941 : No. 1 (34) : 50–77.

Working under the direction of T. D. Lysenko, the authors have carried out a number of grafting experiments on tomatoes and potatoes. The whitish-yellow fruited tomato variety Albino

* An extended summary of this paper is on file at the Bureau.

was grafted on to various red fruited varieties. The grafts formed fruits which varied in colour, some being yellow, some having pink spots, some pale pink and some bright pink. Seeds from these fruits were sown in the greenhouse. The yellow and spotted fruits gave rise mostly to progeny with only yellow fruits; the pink and red fruits gave some red, some pink (raspberry colour), some golden yellow and some whitish-yellow, the coloration being in some cases more intense than that of the grafted fruit. Some of the yellow fruits with pink spots contained seeds giving rise to plants bearing red or raspberry coloured fruits. Some of the progeny also had compound inflorescences, a character of the small fruited Mexican variety used as rootstock; some bore inflorescences of both types on the same plant. Variation also occurred in respect of number of locules.

In potato wild short-day species such as *Solanum demissum*, *S. acaule*, *S. punae*, etc., which have had a domestic variety grafted upon them, form tubers almost as early as the domestic varieties, i.e. while the length of day is still quite long. In the reverse grafts the tuber formation of the domestic varieties was retarded. Similar results were obtained from grafts between two domestic varieties. Among others, the variety Odenwälder Blaue was grafted on to Ella; the tubers formed were white but the sprouts produced by them had purple patches, which gradually disappeared during development. The plants so produced also bore white tubers but their sprouts were more strongly pigmented than those of the original graft and the colour persisted longer, in some plants up to the time of flowering. In the following year's crop the blue pigmentation was so intense that the plants could scarcely be distinguished from the variety Odenwälder Blaue, and some of the tubers bore blue patches round the eyes; the same plant might bear both white and patchy tubers.

The conclusion is reached that the changes induced by grafting are transmitted to a greater extent in the sexual progeny of the tomato grafts than in the vegetative progeny of the potato grafts. For instance as regards earliness, the later generations from the potato grafts gradually revert to the late type. However, when the tomato Best of All was grafted on to black nightshade fruit formation in the scion was accelerated and many of the families in the seed progeny of these fruits were also early in maturity, flowering and ripening about 70 days before the ungrafted control. Fruits with a pointed end were often found too in the progeny and more often than not bred true in later generations.

The authors therefore disagree with the assertion that changes are more readily transmitted vegetatively than through the seed. No difference in principle between vegetative and seed hybrids is recognized. Certain cases are reported in which no segregation for the new character occurred.

83. *Borkovskaja, V. A. 575.257:635.64
(Graft hybrids and chimaeras).
Jarovizacija 1941 : No. 1 (34) : 78–83.

A variety of different methods have been employed for contriving the maximum degree of dependence of the scion on the stock so as to ensure the maximum degree of influence over its development. Tomato grafts are referred to where the characters of the stock have been successfully transmitted to the seed progeny of the scion. From her observations the author concluded that the zone where the greatest mutual influence between the cells of host and scion occurs is in the region of fusion of the two forms. A graft of black nightshade on tomato was cut down at this point, exposing the tissues of both species at the cut surface. Various aberrant shoots were obtained, intermediate in many of the characters distinguishing the parental species. In the resulting plants the flowers were sterile but set a few seeds when pollinated with a mixture of pollen of the two parents. The fruits and seeds produced were also intermediate in many respects. Variation of certain individual characters to a greater or lesser extent was observed in most of the plants studied. The author rejects however the supposition that the plants are chimaeras.

84. Khazina, E. P. 575.257:635.64
(Alteration of the fruit form in the seed progeny of grafts).
Jarovizacija 1941 : No. 1 (34) : 84–89.

The tomato Humbert, with elongated, bilocular fruits, was grafted on to black nightshade (*Solanum nigrum*), tobacco and various other Solanaceous plants.

* An extended summary of this paper is on file at the Bureau.

The fruits of the graft on the nightshade were not very different from the Humbert type, their seed progeny however differed in being more vigorous and bearing a number of compound inflorescences; the fruits were not however different. Some of these plants were again grafted on to the nightshade, again bearing fruits of typical form and structure. Their seed progeny this time showed marked deviations; from 20 plants grown in the greenhouse 17 bore fruits more or less of the Humbert type, 2 had round bilocular fruits, and 1 had large round fruits with locules varying from 2 to 6 in number. Out of 39 plants grown in the open, all from the seed of one fruit, 1 had small round fruits, 6 had large round fruits, some of which were ribbed and the remaining 32 were of the Humbert type. The large round fruits had a higher acid and sugar content than those of the Humbert type or the Humbert control. Somewhat similar results were obtained in the progenies of Humbert grafts in which a branch of nightshade was inserted in such a way as to have Humbert tissue both above and below.
Grafts of Humbert on *Lycium barbarum* bore fruits that were shorter, very highly coloured and sweet. Some of the seed progeny had 3 locules and differed also in flavour; seed from these gave 11 plants of which 2 bore almost round fruits with 3–4 locules, differing also in chemical composition and flavour.
Differences were noted in the progeny of fruits from grafts on *Petunia*, *Datura* and tobacco. Some of the seedlings obtained from the above grafts are of interest for breeding.

85. Lysenko, T. D. 575.3
(What is Michurin's genetics ?)
Jarovizacija 1940 : No. 6 (33) : 3–19.
No distinction is made in the Michurin doctrine between somatic and hereditary tissue; the fact that seed progeny is less easily affected by environment than vegetative progeny is ascribed to the greater security of the seed as regards food supplies. The transference of chromosome alterations is cited as an example of the inheritance of acquired characters. Vegetative hybrids are cited as evidence of hereditary change independent of the chromosomes. Further reference is made to the author's tomato graft hybrids (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 622). Other graft hybrids in tomato affecting fruit form, fruit size, leaf form and habit of growth are mentioned. The influence of grafting on the hereditary constitution of the organism is through the alteration of the nutrient materials. As an illustration of the direct hereditary effect of changed environment the author cites the conversion of winter wheat into spring wheat by applying a warm period instead of cold towards the end of the process of vernalization. The reverse phenomenon has also been reported and reference is made to winter forms, growing as escapes in areas where only spring forms are grown, and characterized by great winter-hardiness.
On the basis of these observations the author argues that the teaching of classical genetics in the universities should be replaced by Michurinism.

CYTOLOGY 576.3

86. Eigsti, O. J. 576.3:581.331.23:578.8
Methods for growing pollen tubes for physiological and cytological studies.
Proc. Okla. Acad. Sci. 1940 : **20** : 45–47.
The construction of a chamber for growing pollen tubes on artificial media is described and the general procedure for growing pollen tubes for cytological work is outlined.

87. 576.3:582
Oláh, L. 633.491:576.356.5:575.127.2
A kromoszóma-kutatás szerepe a növény-rendszertanban. (**The role of chromosome research in plant systematics**).
Bot. Közl. 1939 : **36** : 144–52.
This general review of the application of nuclear cytology to systematics contains a reference to the author's work on crossing the triploid *Solanum Commersonii* ($2n = 36$) with diploid species. When *S. Commersonii* was pollinated by *S. chacoense* ($2n = 24$) the F_1 had 32 to 34 somatic chromosomes. Pollination by *S. papachusa* ($2n = 24$) gave an F_1 with 30 to 33

chromosomes, but *S. Henryi* as pollen parent gave an F_1 with only 24 to 27 chromosomes. The author argues that this is because *S. Henryi* is more closely related to *S. Commersonii* than are the other two diploid species.

88. Bogyó, T. 576.312:575:633
A növény- és állatnemesítés ujabb sejttani alapjai. (**Modern cytological basis of plant and animal breeding**).
Mezögazdas. Kutatás. 1940 : **13** : 42–47.

A general historical review forms an introduction to this report on the Congress of Genetics, Edinburgh, 1939, with a detailed account of the various classical and modern schools of cytology and genetics. Considering the relations of genetics and cytology to agricultural experimental and breeding work, special attention is given to the importance of crossing-over and also of polyploids, autoploids and autosyndesis. Blakeslee's experiments on *Nicotiana* crosses and Randolph's work on artificial chromosome duplication are mentioned as well as Koller's experiments on crossing-over. The phylogenetic significance of crossing-over is considered, Darlington's paper on the explanation of evolution and differentiation as well as Koller's on chiasmata in the sex chromosomes of the mammals being specially mentioned.
Contrary to Koller's theory that crossing-over does not extend to sex-determining genes, the writer suggests that considering that sex is a complex effect, it can still be supposed that in some cases minor sex abnormalities and intersexual forms would emerge as a consequence of crossing-over. This should be in the author's opinion, a proof of the imperfectness of differentiation as well as of the process of differentiation itself.
The cinematographic picture made by Barber and Darlington is mentioned as pioneer work in the photographing of living chromosomes in movement.
Reference is made to Oláh's recent study on the pairing of chromosomes (cf. Abst. 87).

A. B. B.

89. Caspersson, T. 576.312:577.1
Studien über den Eiweissumsatz der Zelle. (**Studies on the protein metabolism of the cell**).
Naturwissenschaften 1941 : **29** : 33–43.

The results of studies on ultra-violet absorption of different nuclear structures at different stages of mitosis are reported. On the basis of these and other data the author concludes that it is a function of the nucleus to form the main centre for the protein metabolism of the cell. The presence of nucleic acids is essential for any kind of biological protein synthesis. These are of the ribose type except in the special case of the gene, which is characterized by combination in a strong linear structure, where the nucleic acids are of a desoxyribose type. The genetically active euchromatin produces during telophase protein substances with an ultra-violet absorption similar to that of albumin or globulin and which most probably belong to the higher protein bodies. The heterochromatin produces large quantities of protein of the simpler histone type, which are taken up in the development of the main part of the nucleolus and then induce the formation in the cytoplasm of ribosenucleotides and protein substances.

90. Gulick, A. 576.312.32:581.192
The chemistry of the chromosomes.
Bot. Rev. 1941 : **7** : 433–57.

This review contains accounts of the organic analysis of nuclei, the chemistry of nucleic acids, the lipid and mineral contents of nuclei and chromosomes, organic micro-chemical tests, the interpretation of staining reactions, the sizes of amino-acids and the molecular structure of chromosomes and of the question of the existence of genes as chemical entities. There are 130 references in the bibliography.

91. 576.356:537.531
Câmara, A. 635.651:576.356
Cromonemata ramificados induzidos pelos raios-X. (**Ramification of the chromonemata induced by X-rays**).
Boll. Soc. Ital. Biol. Sper. 1940 : **15** : 61–70.

Lateral satellites, in no way connected with the formation of the nucleolus, were observed in X-rayed material of *Vicia Faba* and *Aloe arborescens* and thought to be the result of ramifications of the chromonemata.

92. CÂMARA, A. 576.356:537.531
Ruturas e rearranjos cromosómicos induzidos pelos raios-X. (**Chromosome breakages and rearrangements induced by X-rays.**)
Scientia Genetica 1940 : **1** : 339–53.

Inflorescences of *Aloe arborescens* were treated with X-rays of varying intensities. The results suggest that each chromosome has a region in which it is most susceptible to rupture. Different clones of the species treated with the same dosage showed somewhat different amounts of chromosome irregularities, the percentage of anaphase bridges varying from 8 to 13 in different clones. The percentage of breakages with dosages rising from 100 to 700 *r* rose according to an exponential curve; there was a marked break between the regions of 300 and 500 and some wave lengths but not with others, suggesting an analogy with the phenomenon of solarization. The conclusion is reached that chromosome rearrangements arise as a result of breakages or the ensuing bridges.

93. CÂMARA, A. 576.356:581.039
A centrifugação fonte de variações cromosómicas. (**Centrifuging, a source of chromosomal variations**).
Agron. Lusitana 1940 : **2** : 181–202.

Continuing the previous investigations (see "Plant Breeding Abstracts", Vol. VIII, Abst. 1459), the author subjected flower buds of *Rhoeo discolor* to revolutions of 3,000 per minute for 15 minutes in a centrifuge with a radius of 140 mm. It was noted in the resulting material that the nucleoli assumed a centrifugal position and the univalents a peripheral position in the cell; the chromosome chains were frequently broken. Some of the elements were occasionally even extruded from the cell. Bridges and various other irregularities were observed. Chromosome duplication was rare and seemed to occur only when cells were treated in the early stages of meiosis.

94. HAGA, T. 576.356.5:576.12
(**A critique on the conception of the genom**).
Jap. J. Genet. 1940 : **16** : 211–27.

The genom concept, the homologies of different genoms and the differentiation of genoms are considered. It is pointed out that genoms may show both stability and mutability and that the differentiation of genoms is at least as important as their supposed stability. References are made to genom analysis work with the *Aegilops-Triticum-Haynaldia* group, with *Gossypium* and with *Brassica.*

95. SENGBUSCH, R. v. 576.356.5:581.04:633.
Polyploide Kulturpflanzen (Roggen, Hafer, Stoppelrüben, Kohlrüben und Radieschen). [**Polyploid cultivated plants (rye, oats, turnips, swedes and radishes**)].
Züchter 1941 : **13** : 132–34.

Progress is reported in the multiplication of polyploid strains derived from colchicine treated parents. In 1941 the following numbers of tetraploid plants were reached: rye 30,000, oats 150, turnips 5,000, swedes 30, radish 5,000.

In rye the establishment of blocks of tetraploid plants and the almost complete exclusion of haploid pollen has led to an increase in fertility from 5% or less to about 40%. After unsuccessful attempts to double the chromosomes of oats in 1938 and 1939, success was achieved in 1940 with the varieties Flämings Gold and Flämings Treue ($2n = 42$) by treating germinating seed with 0·02–0·03% colchicine for 24 hours. By crossing tetraploid swedes with tetraploid turnips it should be possible to produce amphidiploid swede-turnip hybrids.

In 1942 it will be possible to begin yield tests with polyploid material.

96. 576.356.5:581.04:635.652
TRAUB, H. P. 576.356.5:581.04:635.25
Effect of sulfanilamide and other sulfa compounds on nuclear conditions in plants.
J. Hered. 1941 : **32** : 157–59.

Seeds of *Phaseolus vulgaris* were soaked for 6½ hours in a 0·5% solution of sulphanilamide and then germinated. Many of the treated plants had deformed or thick leaves and stomata and pollen grains larger than those in the control plants. It is suggested that polyploidy had been

induced in the treated plants. Onion bulbs were placed with their roots in sulphanilamide solutions. Cytological examinations of these treated roots showed abnormal mitoses and cells with the tetraploid chromosome number.

97. Pirschle, K. 576.356.5:632.1
Resistenzversuche mit polyploiden Pflanzen. (**Resistance investigations with polyploid plants**).
Naturwissenschaften 1941 : **29** : 338–39.
In experiments with *Stellaria media* in different concentrations of culture solution and in different conditions in a "climate chamber" no evidence was obtained to suggest that the autotetraploid form was more resistant or more adaptable than the diploid.

MICROSCOPIC TECHNIQUE 578.6

98. Michel, K. 578.6:576.312.32
Die Darstellung von Chromosomen mittels des Phasenkontrastverfahrens. (**The representation of chromosomes by the phase-contrast method**).
Naturwissenschaften 1941 : **29** : 61–62.
The phase-contrast method involves the use of ring diaphragms in the substage condensor of a microscope. By its aid contrast equal to that normally produced by fixing and staining can be obtained in untreated preparations of living chromosomes. It is necessary to have only a single layer of cells.

BOTANY 58

99. Noguchi, Y. 581.143.26.03:575:633(52)
(**Practical application of photoperiodism and vernalization**).
Bot. and Zool. 1938 : **6** : 180–88.
Having reviewed the research on photoperiodism by Oakley and Westover on alfalfa and of Maximov, Ross, Voss, and others on wheat in distinguishing varieties and Emerson's experiments on its use in artificial hybridization, the author claims to be the first investigator to have applied these principles to rice breeding. Fuke too succeeded in saving a year in breeding of lowland rices by exposing F_1 hybrids to electric light and short-day illumination.
In Japan electric light treatment has been used in horticulture specially for producing very early ornamentals.
Vernalization has been used by Kakizaki and Kido in hastening heading in lowland rice by exposing the grains to a temperature of 37° C. Teshima and Takasugi have also used high temperature vernalization with maize, beans, peas, etc., and perfect maturation of a late variety of maize even in such an unsuitable district as Sapporo was obtained by this means.

100. Eyster, W. H. 581.162.52
The induction of fertility in genetically self-sterile plants.
Science 1941 : **94** : 144–45.
A self-incompatible strain of petunias can be successfully self-pollinated either by bud pollination or by spraying the flowers with an aqueous solution (10 parts per million) of alpha naphthalene acetamide. The latter procedure has given similar results with *Tagetes erecta*, *Brassica oleracea* and *Trifolium pratense*.

PLANT DISEASES AND PESTS 632*

101. Burkholder, W. H. and
Li, C. C. 632.3:576.16
Variations in *Phytomonas vesicatoria*.
Phytopathology 1941 : **31** : 753–55.
Ten isolates of *P. vesicatoria* were inoculated into nine varieties of tomatoes and into seven varieties of pepper. Some isolates could infect both tomatoes and peppers and some peppers only. Also some isolates only produced very slight infection on the two pepper varieties, Oshkosh and Harris' Early Giant. There is thus no doubt that different races of the pathogen exist.

* See also Absts 60–1, 69 (Pyrethrum); Abst. 71 (Ustilago and Tilletia).

102. BULLER, A. H. R. 632.4:577.8:575.1
The diploid cell and the diploidization process in plants and animals, with special reference to the higher fungi.
Bot. Rev. 1941 : **7** : 335–87, 389–431.

Among the many topics discussed in this important review of sexuality and sexual reproductions in the higher fungi are "Mendelian dominance in hybrid mycelia and fructifications", "diploidization in rust fungi and pyrenomycetes", "geographical races and the Buller phenomenon" and "the Buller phenomenon in rust fungi and pyrenomycetes".

103. KREUTZER, W. A.,
BODINE, E. W. and
DURRELL, L. W. 632.411.4:577.8:633.842
A sexual phenomenon exhibited by certain isolates of *Phytophthora capsici*.
Phytopathology 1940 : **30** : 951–57.

Pairing in the same Petri dish a culture of *Phytophthora capsici* obtained from the stem of a wilted pepper plant with one isolated from decaying cucumber fruit resulted in the formation of oospores. No such phenomenon was observed when pepper isolates were paired or when cucumber isolates were paired. In some cultures, however, after the isolates had been held in culture from 6 to 8 months, oospores were formed without mixing of isolates.

104. HENRICI, A. T. 632.422.3:575.1:576.312
The yeasts. Genetics, cytology, variation, classification and identification.
Bact. Rev. 1941 : **5** : 97–179.

This review is concerned with the cytology and genetics of yeasts, with their induced and spontaneous variations and mutations, and with their classification and identification. The work of Winge and Lausten (see "Plant Breeding Abstracts", Vol. X, Abst. 711, Vol. VIII, Abst. 430) receives special consideration in the section on genetics. There are 126 references in the bibliography.

105. BAUCH, R. 632.422.3:576.356.5:581.04
Experimentelle Mutationslösung bei Hefe und anderen Pilzen durch Behandlung mit Campher, Acenaphthen und Colchicin. (**Experimental induction of mutations in yeast and other fungi by treatment with camphor, acenaphthene and colchicine**).
Naturwissenschaften 1941 : **29** : 503–04.

While yeasts proved very resistant to the action of colchicine, better results were obtained with acenaphthene, especially with simultaneous raising of the temperature. Camphor vapour was found to be particularly potent in producing alterations. At first it produced a stoppage of growth. This was followed by the production of long, threadlike, multicellular mycelia. These either died or turned after a time to budding, with large cells. A great number of aberrant forms were obtained from such treated cultures, of special interest being those with larger cells than the original clones. It is suggested that these are polyploid forms. Some of them grow as well as the original forms and seem capable of more rapid and intensive fermentation.

106. FISCHER, G. W. and
HOLTON, C. S. 632.451:575.127.2:575.11:633.13
Inheritance of sorus characters in hybrids between *Ustilago Avenae* and *U. perennans*.
Mycologia 1941 : **33** : 555–67.

The inheritance of the four sorus characters—covered, naked, powdery and indurate—was studied in hybrids between *Ustilago Avenae* and *U. perennans* (for the pathogenicity of these hybrids, see "Plant Breeding Abstracts", Vol. XI, Abst. 923). The naked and powdery characters were found to be dominant over covered and indurate respectively. The two character pairs are inherited independently. It is also suggested that *U. Avenae* and *U. perennans* are synonymous from the morphological identity of their chlamydospores, from their genetic relationship and from their host range.

107. 632.451.2:576.16:633.13
TERVET, I. W. 633.13–2.451.2–1.521.6
Problems in the determination of physiologic races of *Ustilago avenae* and *U. levis*.
Phytopathology 1940 : **30** : 900–13.

The percentage smut produced by 17 collections of *U. levis* and 63 collectons of *U. avenae* when inoculated on eleven varieties of oats was determined. The smuts were collected principally in the Mississippi Valley basin. The oat varieties used were Anthony, Iogold, Gopher, Rusota, Black Mesdag, D.C.II–22–220, Bond, Fulgrain, Markton, Nakota and Navarro. Variations in the abilities of some collections to attack the same variety in different years were shown in some cases to be due to a selective effect of the host in increasing certain biotypes of the smut at the expense of others. Attempts to increase the virulence of races of *U. avenae*, which slightly attack Bond and Fulgrain, by repeated increase of them on these two varieties were unsuccessful. Three races of *U. levis* and three of *U. avenae* can be distinguished on the basis of their pathogenicity on the five oat varieties—Anthony, Gopher, Rusota, Iogold and Black Mesdag. Markton, Navarro and Nakota were not attacked by any smut collection. D.C. II–22–220 resembles Black Mesdag in its reaction to smut.

108. OLIVEIRA, B. de. and
SOUSA, M. C. F. de. 632.452:576.16:633.11(46.8)
Raças fisiológicas da *Puccinia graminis tritici* em Portugal. (**Physiological races of *P. graminis tritici* in Portugal**).
Agron. Lusitana 1940 : **2** : 243–52.

The study of the Portuguese races of black stem rust has been made in connexion with the wheat breeding operations of the Estacão Agronómica Nacional. Six races were discovered, one of which was new and has been given the number 187.

Tests were made of the resistance of the Portuguese wheats to the three most prevalent races, 24, 27 and 40. Some varieties segregated in respect of rust reaction and none was resistant to all three races.

109. 632.951.1:581.6:575(47)
GREENER, B. M. 632.951.1:575.127.2
(Breeding pyrethrum for insecticides).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1941 : No. 6 : 13–16.

Great differences were observed from plant to plant in respect of vegetative characters, number and weight of inflorescence and pyrethrin content. Certain forms with high pyrethrin content were isolated and were found to transmit the quality; thus the six best numbers in 1933 had contents varying from 0·95 to 1·25%, their bagged progeny in 1935 varied from 1·06 to 1·51%, their open pollinated progeny from 1·25 to 1·75%.

In the period 1937–40 from 2,068 plants examined 67 have been selected on the score of content of pyrethrin I, yield, uniformity of inflorescence and resistance to shedding. In 1939 the 21 best lines were selected, having a content of pyrethrin I varying between 1·09 and 1·52%.

Studies have also been made on floral biology and a number of interspecific crosses have been made. Thus 20 hybrids have been obtained of *Pyrethrum cinerarifolium* x *P. carneum* and *P. cinerarifolium* x *P. macrophyllum*. They are intermediate between the respective parents in morphological characters and their total pyrethrin content is from 1·06 to 1·26%. All the hybrids were sterile, both in selfs and back-crosses. Several spontaneous hybrids of *P. cinerarifolium* x *P. carneum* and *P. cinerarifolium* x *P. macrophyllum* have been found.

In selecting the best parents for crossing, the plants with the greatest number of glands on the ovaries of the centre florets were selected.

By means of selection the pyrethrin content of the cultivated population has already been raised from 0·6 to 0·9%. In the hope of finding a suitable substitute for pyrethrum in northerly areas, chemical analyses have been made of a large number of allied species and genera. Only *P. carneum* and *P. roseum* contained any appreciable quantity of pyrethrin I (from 0·09 to 0·5% in wild forms) with a positive reaction to acid of chrysanthemum. Certain other species contained appreciable quantities of pyrethrin but without toxicity. Selection work has therefore been started on the above two species and appreciable increases have already been effected in pyrethrin content and yield per plant. Crosses have also been made of *P. carneum*

with *P. corymbosum* and *P. macrophyllum.* The hybrids are intermediate in morphological characters but low in pyrethrin I content (0·06%). Most hybrids were sterile but seed was obtained from some plants of *P. carneum* x *P. corymbosum.*

ECONOMIC PLANTS 633

110. BURKLAND, E. R. 633:576.16(73+8)
Plants America gave the world.
Agric. Amer. 1941 : **1** : No. 8 : 1–6, 16.
A popular article. The origins of the following crops are briefly discussed—maize, potatoes and sweet potatoes, cacao, manioc, peanut, rubber, cotton, tobacco, cinchona, and many vegetables, fruits and timber trees.

111. TYLER, J. 633–2.6–1.521.6
Plants reported resistant or tolerant to root knot nematode infestation.
Misc. Publ. U.S. Dep. Agric. 1941 : No. 406 : Pp. 91.
This publication is a compilation of reports on all plant species and varieties that have been called either resistant or tolerant to infestation by the root knot nematode, *Heterodera marioni* (Cornu) Goodey (formerly *H. radicicola* (Greeff) Müller). One of its purposes is to bring together all available information on the subject in a condensed form for the use of plant breeders. There are 269 references in the bibliography.

CEREALS 633.1*

112. HUSKINS, C. L. 633.1:575.24:576.356.5:576.356
Symposium on "Theoretical and practical aspects of polyploidy in crop plants". Polyploidy and mutations (with discussion by H. E. Warmke).
Amer. Nat. 1941 : **75** : 329–46.
It is suggested that mutations in polyploid crop plants, such as hexaploid oats and wheat, are predominantly due to chromosome aberrations. The most important cause of aberrations in polyploids may be hybridization. Thus hybrids, even from crosses between very similar varieties, are apt to be characterized by abnormalities of meiosis such as multivalent and univalent formation and the occurrence of bridges. These irregularities then produce a range of aberrant types of progeny. It is also pointed out that the pure line theory is at best a concept which is only true within certain limits and that polyploids can breed true only so long as pairing is rigidly restricted to chromosomes that are completely homologous. Occasional irregularities in pairing, however, have been found to occur even in old-established varieties of wheat and oats.
In the discussion a short account is given of the relationship between polyploidy and evolution.

113. BRANDL, M. 633.1:581.05:578.088
Zur Sortenbeschreibung unserer Getreidearten. (**On description of varieties of our species of cereals**).
Forschungsdienst 1940 : **10** : 606–07.
The author suggests that for each district a climate chart should be drawn up in which (1) the various possible dates for the cultivation of the various cereals and (2) the meteorological data from these dates onwards would be recorded. These observations would also have to be carefully recorded in experimental tests of varieties for registration, from the time of sowing to maturity of the individual varieties.
By this means the climatic requirements of the different varieties could be determined and included in the official varietal descriptions for the assistance of breeders and growers.

---

* See also Absts 72–3, 81, 95.

114. 633.11:575(47)
MARUŠEV, A. I. 633.14:575(47)
(Industrial qualities of varieties of wheat, winter rye and millet bred at the S.E. Institute of Grain Culture).
Socialistic Grain Farming, Saratov 1940 : No. 2 : 51–61.

Many recent spring wheat selections of the Saratov Station, as well as the older hybrids Sarrubra and Sarrosa, are distinguished by high milling and baking quality. Sarrubra has excelled Thatcher in baking quality. Some of the *T. durum* selections, particularly the awnless varieties, are high in baking quality too.

Some of the station's new winter wheats are almost equal to the best spring wheats in quality; these include one of the wheat-rye hybrids.

For macaroni making some of the *T. durum* selections, especially the awnless varieties, have proved particularly high in quality; the hybrids Sarrubra and Sarrosa are almost equal to them in this respect.

Various improved varieties of rye have been produced; Saratov No. 1 gives a loaf of greater volume and better colour and porosity than any other rye.

White-grained millet selections have proved superior to others in quality.

115. STARKOV, A. A. 633.11:575(47)
(The best varieties of spring wheat in the Rostov region).
Socialistic Grain Farming, Saratov 1940 : No. 3 : 44–49.

Descriptions are given of Pionerka, resistant to Hessian fly, rust and loose smut and high in baking quality; Hordeiforme 672, superior in yield and baking quality; Artemovka, resistant to Hessian fly, rust, loose smut and drought.

116. DEREVITZKY, N. F. 633.11:575:578.08
(Terms for sowing and approval of winter wheat varieties).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1941 : No. 6 : 11–12.

Tests were made with a number of varieties sown at three different times. The results showed differences in the relative merits of the varieties at the different sowing times. Thus Belaja Tserkov' No. 156 was 1st in the early sowing and 12th in the late while Verkhnjačka No. 015 was the reverse. Ramon' No. 883 was least affected, being classed therefore as the most "plastic" variety.

This method of testing is recommended in breeding for areas with variable autumn conditions.

117. ÅKERMAN, Å. and
FRÖIER, K. 633.11:575"793"(48.5)
Vårveteodling och vårvetesorter. **(Spring wheat growing and spring wheat varieties).**
Lantmannen 1941 : **25** : 308–10.

The extension of spring wheat cultivation in Sweden during the last 40 years has been largely due to the achievements in plant breeding which have resulted, among other advances, in greatly improved quality. Earliness too has received attention from the breeder and early varieties suitable for Götaland and Svealand have been produced.

Among the later spring varieties produced in Sweden Kolben II and Weibull's Atle—both intended for the Skåne region—are the best. Among the earlier spring wheats Diamant I and II (whose parentage is given) are among the most popular and occupy about 70% of the area under this cereal in Sweden as well as in Finland and Norway. Owing to the much higher yield and equal earliness of Diamant II, as compared with Diamant I, the latter should soon be replaced by the former.

In eastern Sweden Fylgia spring wheat has surpassed Diamant in grain yield, but breeding operations are still directed to replacing it by a variety with superior qualitative characters.

118. †DOLGUŠIN, D. A. 633.11:575.12:575.3
(Seed production of grain crops).
Jarovizacija 1941 : No. 1 (34) : 6–26.

The author outlines the methods of seed production in general. In touching upon the question of seed rejuvenation the use of intravarietal crossing is discussed. It is claimed that loss of

* See also Absts 59, 69–71, 78, 108. † An extended summary of this paper is on file at the Bureau.

vigour occurs even in normally self-pollinated plants where selfing is repeated over a number of generations. Growing two plants of the same variety, or even two halves of the same plant, under different environmental conditions, produces sufficient difference to increase the fertility and vigour on crossing them. Intravarietal crossing is thus recommended, taking a locally adapted variety as seed parent and surrounding it with forms grown in as many as possible different localities. Figures are presented to show that the yield increase produced by this hybridization persists in four or more subsequent generations.

Lysenko's ideas on the selective power of the gametes and the means of overcoming it and consequently shattering the hereditary stability of the organism are expounded. Many examples of selective fertilization are presented.

In cross-fertilized plants too, plants for seed production are surrounded by the best mass selections, so as to provide a wide range of pollen types for the action of selective fertilization; supplementary artificial pollination is also applied. Spatial isolation has been entirely discarded. The progeny of plants subjected to free pollination in this way was almost invariably true to type. Constant yield increases resulting from crossing are reported.

119. 633.11:575.127.2:576.356.5:581.04
633.11:576.16

ŽEBRAK, A. R.

(Experimental production of amphidiploids in sterile wheat hybrids).

Trudy Moskovskoi ordena Lenina Sel'skokhozjaistvennoi Akademii imeni K.A. Timirjazeva 1940 : **4** : Pt 1 : 161–73.

Colchicine solutions of 0·1% were applied to F_1 seeds of *Triticum durum* x *T. Timopheevi* and *T. durum* x *T. monococcum*, F_2 seeds of *T. vulgare* x *T. durum* and certain other hybrids such as *T. polonicum* x *T. Timopheevi* and *T. Timopheevi* x *T. persicum*. Undoubted amphidiploids were obtained from *T. durum* x *T. Timopheevi* and *T. durum* x *T. monococcum*. The amphidiploids were in the form of chimaeras, the plants having some fertile and some sterile ears. The three fertile ears of *T. durum* x *T. Timopheevi* contained 15, 26 and 30 grains respectively, whereas the sterile ears and the control plants produced no grains at all. The fertile ear of *T. durum* x *T. monococcum* contained 26 grains. The amphidiploids are described; in a number of respects they are intermediate between the parent species. The *T. durum* x *T. Timopheevi* amphidiploid possessed the immunity to *Erysiphe graminis* characteristic of *T. Timopheevi*.

The root tips of the *T. durum* x *T. Timopheevi* chimaera contained 28 chromosomes, those of plants obtained from seed of the fertile ears contained 56 and their cells, even in the resting stage, contained 6–8 nucleoli. The size of the cells and of the nuclei was also greater than that of the parent species.

In the *T. durum* x *T. monococcum* chimaera some root tips contained sectors with 21 and 42 chromosomes respectively; other root tips were found with only 42 chromosome cells. Plants from seeds of the fertile ears also had $2n = 42$. This illustrates the possibility that the hexaploid wheats have originated from crosses between diploid and tetraploid species.

120. 633.11:575.127.5:633.289

The new Michels hybrid grass.

Seed World 1940 : **47** : No. 11 : p. 11.

SMITH, W.

Origin of Michels grass and its uses.

Ibid 1940 : **48** : No. 2 : p. 9.

BPI reports on results of Michels grass tests.

U.S. Dep. Agric. Pr. Release 1940 : Pp. 2. (Mimeographed).

According to the first two articles, Michels' grass was bred by the late Dr C. A. Michels, agronomist at the University of Idaho, by crossing Mosida winter wheat as seed parent with *Elymus condensatus* and back-crossing with the winter wheat parent. It is claimed to be a perennial, drought-resistant, forage grass and as such has been released to the seed trade and sold throughout the U.S.A.

According to the Bureau of Plant Industry, however, Michels' grass is not perennial and is considered to be a variety of winter rye, and its chromosome number ($n = 7$) shows that it cannot have the claimed parentage, since winter wheat has $n = 21$ and *E. condensatus* $n = 14$ chromosomes.

121. Schneidermann, Ja. A. 633.11:575.127.5:633.289:575.3
(Intercrossing capacity of wheat with *Agropyron* and the fertility of their hybrids in relation to the conditions of development).
Socialistic Grain Farming, Saratov 1940 : No. 3 : 13–33.
Reference is made to the work of I. V. Michurin on overcoming the sterility of wide crosses. The percentage success in crossing *Triticum vulgare* with *A. intermedium* was 29·4, whilst *T. durum* gave a set of 53·6%. With *A. elongatum* the figures were 20·5% with *T. vulgare* and 35% with *T. durum*; different individuals within each species give different percentage sets. Success varied also with environmental conditions, without any connexion with chromosome number. The type of the F_1 plants too varied distinctly according to the environmental conditions under which the cross was made.
The F_1 plants were of the *Agropyron* type in most characters, as was expected on the basis of observations quoted from the works of Darwin and Michurin, and were perennial. Their fertility varied between 22·3 and 48·3%, being highest in the hybrids of *T. vulgare* x *A. elongatum*; the next highest was *T. durum* x *A. intermedium*. There was no correlation between percentage set on crossing and fertility of the hybrid and environment is thought to be a more important factor than chromosome compatibility in determining fertility.
The yield of the hybrids was highest in the second–fourth years, after which it began to decline but in this respect too different hybrids even of the same species differed, and the results were very much influenced by external conditions, marked differences being observed even between clones obtained from the same plant by vegetative multiplication.

122. Pozdnjakov, M. M. 633.11:575.3.061.6:581.46
(Variation in the ear colour of wheat under the highland conditions of Balkaria).
Jarovizacija 1940 : No. 6 (33) : p. 113.
Plants of a white eared wheat Erythrospermum Moscow 03251 when grown at high altitudes developed ears with a distinct pinkish coloration and would normally be ascribed to the variety Ferrugineum. Some of the coloured ears were identical with the original variety in all other characters, some differed also in ear characters, but the grain was always typical.

123. Titov, P. I. 633.11:581.46:575.3
(Inheritance of awns in wheat).
Socialistic Grain Farming, Saratov 1940 : No. 1 : 122–41.
The complexity of the problem and the diversity of views of the geneticists on the subject of awn inheritance are illustrated by a review of the literature.
The author made a number of crosses in different years and found that the F_2 results in different years differed; e.g. in 1933 the cross Khorossanicum 01248 x Albidum 0604 gave an entirely awnless progeny and in 1937 and 1938 the progeny contained 10·9 and 11·1% respectively of awned plants. Few if any of the crosses conformed strictly to a 3 : 1 ratio and some combinations conformed in one year and not in others. The percentages of awned plants in the F_3 and F_4 generations were different from those of the F_2.
Other F_2 results are presented which also do not fit any simple Mendelian scheme. In *T. durum* x *T. vulgare* crosses the percentage of awned F_2 plants varied between 20·5 and 26·7% in different combinations.
Reference is made to a number of other authors who have obtained anomalous results with awn inheritance and who have found it to be influenced by growth conditions. The results are regarded as being in conformity with Michurin's view that the product of a cross will possess those parental characters which find conditions most favourable for their development.

124. Titov, P. I. 633.11:581.48:575.3.061.6
(Inheritance of grain colour in wheat).
Socialistic Grain Farming, Saratov 1940 : No. 3 : 34–43.
Crosses between red and white grained wheats made in 1933 were repeated in 1937 and 1938; the proportions of red to white in the F_2 were 189 : 58 in 1933, 122 : 50 in 1937 and 6 : 6 in 1938; in the cross between two white grained wheats all the F_2 were white except in 1937 when three red grains appeared. Odd red grains appeared also in the F_3 and F_4 of this cross. White grains often appeared in the progeny from intercrossing two red-grained hybrids. The proportions of red to white in all crosses were different in the F_3 and F_4 from those in the F_2.

In crosses between *Triticum vulgare* and *T. durum* wide deviations from Mendelian ratios were observed.
These results are ascribed to the influence of environment and are cited as evidence of the fallacy of the Mendelian laws.

125. Dem'janovič, N. I. 633.11–2.45–1.521.6:575(47)
(Results of the work of the L'gov breeding station on the production of resistant varieties of winter wheat).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 2–3 : 92–100.
The varieties that have proved most resistant to *Puccinia triticina* are enumerated, their reaction to *Tilletia tritici* being also indicated. The most rust-resistant lines only showed a 4–6% infection even in 1937, the worst rust year, when they gave yields of 28–30 c. per ha. Other varieties were distinguished by high smut resistance. Some of the hybrids combined resistance to both parasites and are at the same time above the average yield.

126. 633.11–2.452–1.521.6(47)
Brojakovskii, N. V. 633.13–2.452–1.521.6(47)
(Susceptibility of winter wheat varieties to brown rust and of oat varieties to crown rust).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1940 : No. 1–2 : 87–99.
The reaction of 160 varieties of *Triticum vulgare* to *Puccinia triticina* is given. Only 46 of them were classed as resistant. The percentage of resistant varieties grown in the collective farms has risen from 21·4 in 1930 to 46·3% in 1937. The most promising of the newly bred resistant varieties are enumerated. These are much more resistant than any of the varieties imported from abroad, all of which without exception have proved susceptible and poor in yield and other qualities. High yields have only been obtained from the new resistant varieties, Lesostepka of the Belaja Tserkov' station and 09 of the Verkhnjačka station being specially mentioned.
Similar studies were made with 69 varieties of *Avena sativa* L, none of which proved fully resistant to *Puccinia coronata*. Some of the Soviet selections are more resistant than any imported variety but further work on the production of resistant oats is desirable.

127. Fahmi, T. 633.11–2.452–1.521.6:575
[A technical method of selecting wheat resisting black rust (*Puccinia graminis*.)].
Egypt. Agric. Rev. 1941 : **19** : 184–92.
Uredospores are collected and maintained active by injecting susceptible varieties with a suspension of the spores. These varieties are sown once a week and injected just before flowering. The injected plants are kept under conditions favourable for spreading the disease. Before the normal date of sowing, seeds of suceptible varieties are sown in rows, plants of which are injected with the activated spores to cause heavy infection. Consequently rust appears rapidly and uniformly. To maintain the field in a high degree of infection the dead plants are replaced by new ones which are simultaneously infected. When the normal date of sowing is due single plants of the stock under selection are transplanted between the contaminating rows.
Progress of disease is recorded weekly and single plants combining resistance and other good qualities are selected and bred under the same conditions for several generations until the appropriate specimen is produced.
However, when conditions unfavourable for early spreading of the disease prevail, the author concluded that the above method of infection compared with others adopted by different plant breeders is unsatisfactory. A. I.

128. 633.11–2.452–1.521.6:575.11
Watson, I. A. 633.11(67.62)
Inheritance of resistance to stem rust in crosses with Kenya varieties of *Triticum vulgare* Vill.
Phytopathology 1941 : **31** : 558–60.
Federation 107 was crossed with two stem rust resistant varieties from Kenya and F_3 lines

were tested for resistance both with single physiological forms in the greenhouse and with a collection in the field. The results of the two types of test agreed closely and showed the segregation of a single factor in each cross. Resistance was only partially dominant in the F_1s. A cross between the two Kenya varieties showed that they carry different factors for resistance, susceptible lines being obtained in F_3.

129. GIORDANO, H. J. 633.11:664.641.016:575(8)
El trigo Sinvalocho M.A. (Sin Rival x 38 M.A.–N.° 32 Rafaela). [**The wheat Sinvalocho M.A. (Sin Rival x 38 M.A. No. 32 Rafaela)**].
"Granos" Semilla Selecta, B. Aires 1939 : **3** : 3–16.

The cross Sin Rival x 38 M.A. was made in 1925; the hybrid No. 32 was first noticed in F_6 selections as having exceptionally high baking quality coefficients; e.g. with the Chopin extensimeter W = 449·9, P = 119·6 and G = 23·12. Other hybrids of the same cross were also promising. The hybrid in question, later named Sinvalocho M.A., is a spring wheat, and has inherited the lodging resistance of Sin Rival and the smut resistance of the other parent; it is 6–10 days earlier than 38 M.A. and ranks as one of the earliest varieties in the country; it is equal or superior to 38 M.A. in resistance to *Puccinia triticina* and *P. graminis*, but is somewhat susceptible to *P. glumarum*; it is rather low in tillering capacity; the variety is free from shedding but threshes more easily than 38 M.A.; it has yielded from 2,000 to 3,000 kg. per ha., having outyielded 38 M.A., especially in late sowings. In spite of its exceptional strength, the grain is not vitreous in texture.

A full description is given of the characteristics of the plant and of the results of tests of the flour. In spite of its very high values for "correcting" it is also suitable for direct use in baking.

The transgression of the parental limits in this hybrid in respect of both baking strength and earliness indicates the presence of complementary genes and makes this cross particularly interesting from the practical standpoint.

Indications are given regarding the regions for which the variety is suited; these are more especially the zones where spring wheat is sown rather late, some 20–25 days after the normal sowing time for varieties such as 38 M.A. Owing to its low tillering capacity it should be sown somewhat more densely than the average.

Though in 1935, when the variety was first introduced, it was only one among 40 other varieties, it is now the most widely sown of all varieties in Argentina, surpassing even Klein Acero. It is very constant and the work on maintaining its purity is described. Variations in unimportant morphological details were neglected in the early stages but as time goes on it may even be possible to attain uniformity in these characters without prejudice to the agronomic merits of the variety.

130. KLEIN, E. 633.11:664.641.016:575(8)
Tres nuevas variedades culturales de trigo. (**Three new cultivated varieties of wheat**).
Rev. Argent. Agron. 1941 : **8** : 154–60.

The new wheat Klein 157 is a hybrid from Hope x Lin Calel M.A. It has given yields of up to 3,000 kg. per hectare. It has proved adaptable to a variety of conditions of environment and remarkably free from attack by all three rusts, loose smut and *Septoria*. The variety requires early sowing (May) but does not suffer unduly when sowing is delayed; it is resistant to frost and to lodging and shedding. The grain is of high quality, exceeding that of Lin Calel in strength and extensibility of the gluten.

The variety Klein Exito is the result of multiple crosses involving Favorito, Americano 25, Ardito, Barleta and Americano 44. It combines a number of the virtues of its several parents, such as earliness, resistance to *Puccinia glumarum*, *P. triticina* and *P. graminis*, and to *Ustilago tritici*, and high baking quality exceeding that of any of its parents. It has a vegetation period from germination to maturity of 133 days and is not too adversely affected by late sowing; it is resistant to lodging and shedding but somewhat susceptible to frost damage.

Klein Alberti is the product of a complex cross involving Favorito, Americano 25, Barleta, Chino, Americano 44 and Ardito. It is an early wheat but is not damaged by frost: it is tolerably resistant to the three rusts and to loose smut and resistant to drought and lodging. It is classed as a good semi-hard wheat, giving a good production of gas. It can be sown at the

same time and under the same conditions as Klein 32, a variety which it greatly surpasses in other qualities.

131. MATSUMURA, S. 633:11*Aegilops*:576.356.52:581.04
(Induced haploidy and autotetraploidy in *Aegilops ovata* L.)
Bot. Mag., Tokyo 1940 : **54** : 404–413.

From 85 florets of *A. ovata* L. ($n = 14$) pollinated by *Triticum dicoccoides* Körn. variety *Kotschyanum* Perc. and treated with colchicine (0·01% solution) 20 hours later 58 grains were obtained of which 55 were sown. Among the 43 seedlings thus obtained was one parthogenetic haploid plant ($2n = 14$) of *A. ovata*. The rest of the F_1 were 28 chromosome hybrids.
Out of 12 grains of *A. ovata* heated with a 0·05% solution of colchicine one diplo-tetraploid chimaera was obtained.
The ears of the haploid were noticeably smaller than in the diploid, while the tetraploid ears of the chimaera were considerably smaller than the diploid ears. Similar size relationships were found in regard to the cell elements of the epidermis of the under surface of the leaves.
At metaphase I in the haploid the chromosome associations included 3_{II} and 1_{III}, but P.M.C. with univalents only were the most frequent.
In general segregation of the univalents to the poles was at random.
The maturation divisions resembled those of the haploid *T. durum* already described by Kihara (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 609).
Nearly all the pollen grains were either empty or poorly filled.
The tetraploid ears of the chimaera showed associations of bivalents and quadrivalents, rarely univalents or trivalents. The pollen grains of these ears were in general larger than in the diploid ears and some were deficient in protoplasmic contents.
The haploid proved sterile under conditions of open pollination or when pollinated by a diploid. The chimaera gave a set of 26·47% when tetraploid ears were artificially selfed, of 25% when $4x$ was crossed by $2x$, and 15·90% from the reciprocal cross.

OATS 633.13*

132. 633.13:575(73)
COFFMAN, F. A. 633.13.00.14(73)
Results from the Cooperative Coordinated Oat Breeding Nurseries for 1939, and the Uniform Winter-hardiness Nurseries for 1939–40.
U.S. Dep. Agric., Bur. Pl. Ind., Div. Cer. Crops and Dis., Washington, D.C. 1940 : Pp. 127. (Mimeographed).

The co-operative co-ordinated oat breeding nurseries organized by the U.S. Department of Agriculture, Bureau of Plant Industry, were first grown in 1924, when data were obtained from 5 points in 5 states. In 1939 data were obtained from about 100 points in 35 states. This wide, co-operative testing of newly bred strains enables the best to be selected much more rapidly.
The data presented in this report fall under three main divisions, the first concerning mid-season oats. The mid-season oat area extends across the north of the U.S.A. from Atlantic to Pacific and is subdivided into irrigated, dry land and humid areas, the humid area being subdivided into (*a*) the north-western and (*b*) the central and eastern sections. Data are given for tests in all these areas and also on new disease-resistant mid-season hybrid selections.
The second main division is that of the early maturing oats, the area of which also extends across the U.S.A. from east to west and overlaps the mid-season oats area in the north and the winter oats area in the south. It is subdivided into the northern early oat area and the southern or spring-sown red oat area. The production of rust- and smut-resistant hybrids for the first of these subdivisions forms the major phase of the co-ordinated oat breeding programme; data on these are presented for selections from Markton crosses, from Victoria x Richland and from double crosses. Tests with spring-sown red oats are also reported and these again are now mainly disease-resistant selections.
The third main division is the winter oat area, extending across the entire south of the country and also including some stations in the Pacific Coast states. Data are given on the yields of disease-resistant winter oat hybrids and on survival in the uniform hardiness nurseries.

---

* See also Absts 60, 68-9, 106-7, 126.

133. Ellison, W. 633.13:576.356.5:575.127.2
The cytology of certain diploid, triploid and tetraploid *Avena* hybrids.
Genetica 1940 : **22** : 409–18.

Some of the work here reported has already been reviewed in "Plant Breeding Abstracts", Vol. XI, Abst. 535. The unidentified species Cc 1795 has been shown to be homozygous for a segmental interchange relative to *A. brevis* and *A. Wiestii*. The ring of four produced in the hybrids with these species is constantly arranged disjunctionally and non-disjunctionally in the ratio 2 : 1.

A triploid hybrid, *A. longiglumis* ($2n = 14$) x *A. Abyssinica* ($2n = 28$) was studied. At first metaphase $5_{I} + 5_{II} + 2_{III}$ was the commonest conjugation; an occasional quadrivalent was observed. Disjunction and orientation were irregular at both divisions and less than 10% of apparently good pollen was produced.

In the tetraploid hybrid *A. longiglumis* x *A. sativa* ($2n = 42$), more than half the chromosomes paired as bivalents and most of the rest remained unpaired, though occasional bivalents and quadrivalents were seen. The first division of meiosis ran a fairly regular course, with the paired chromosomes in the middle of the plate and the univalents round them, but the second division was very irregular. Anaphase bridges were observed at both divisions. Less than 1% of the pollen appeared viable.

134. 633.13–2.4–1.521.6:575(73)
Marion, a new oat variety, has advantages.
Seed World 1941 : **49** : No. 1 : p. 9.

The spring oat variety Marion, bred by the U.S. Department of Agriculture is high yielding, resistant to stem rust, leaf rust and smut and produces good quality grain.

135. Reed, G. M. 633.13–2.451–1.521.6:575.11
Inheritance of smut resistance in some oat hybrids.
Amer. J. Bot. 1941 : **6** : 451–57.

The reactions of the F_2 and F_3 generation hybrids of the five oat crosses—Canadian x Monarch selection, Gothland x Black Mesdag, Danish Island x Black Mesdag, Monarch selection x Gothland and Green Mountain x Monarch—to race 1 of *Ustilago avenae* and race 1 of *U. levis* were investigated. Race 3 of *U. levis* instead of race 1 was used in the Green Mountain x Monarch cross. Resistance to race 1 of *U. avenae* was found to be due to a single dominant factor in three crosses. Resistance to race 1 of *U. levis* depended on a single dominant factor in one cross and resistance to race 3 of *U. levis* was also due to a single dominant factor in one cross. Crosses of two susceptible parents gave F_2 and F_3 generations which were completely susceptible. In the cross Gothland x Black Mesdag, the F_3 results suggest that the inheritance of resistance to race 1 of *U. levis* in this cross depends upon three factors. The data also show that Black Mesdag and Monarch selection must carry different factors for resistance to race 1 of *U. levis*.

136. Tervet, I. W. 633.13–2.451.2–1.521.6:631.531.12
The relative susceptibility of different lots of oat varieties to smut.
Phytopathology 1941 : **31** : 672–73.

Using surface-sterilized seed, it was found that seed material of the same stock of Anthony oats differing in age and in place of origin gave different percentages of infection when inoculated with a purified collection of *Ustilago levis*.

RYE 633.14*

137. Gluščenko, I. E. 633.14:575.12.
(Results of twice repeated cross-pollination of rye in the plots of the collection).
Jarovizacija 1941 : No. 1 (34) : 27–33.

Further data are given on results of emasculating plants and allowing them to open-pollinate when surrounded by plots of other varieties. Two consecutive years of such crossing produced no appreciable diminution in purity of type; the crossed progeny however gave a much better winter survival than "original" seed and the crossed plants had larger ears, and heavier grain.

* See also Absts 71, 114, 120.

Out of 65 varieties so treated 6 entirely lost their type, whilst certain others became contaminated; these were mainly Siberian ryes, which when grown in Odessa lose their stability. Even in these cases the yield and grain weight were increased.

138. Mokrov, S. V. 633.14:575.14:581.162.32
(Stability of characters in cross-pollinated plants).
Jarovizacija 1941 : No. 1 (34) : 34–36.

After growing a green stemmed strain of Petkus rye adjacent to a grey stemmed form without bagging, the progeny of the green plants in the first generation contained 140 grey stemmed plants to every 100 green. After two generations of such multiplication the proportion was 100 green to 282 grey. When these green plants however were grown adjacent to grey plants they produced in their progeny much fewer grey plants than did green stemmed "original" grown under similar conditions.

139. Smagin, G. D. 633.14:581.46:575
(An experiment on breeding double-eared rye).
Jarovizacija 1940 : No. 6 (33) : 105–07.

The grain from a branched rye ear was sown for five consecutive generations before any progeny with branched ears appeared. The proportion of branched ears in the progeny in succeeding years rose progressively. Branched ears are also collected each year in the rye fields of the collective farms and large plots of it are now sown. Some varieties are more prone than others to produce them.

140. Ling, L. 633.14–2.451.3–1.521.6
The histology of infection of susceptible and resistant selfed lines of rye by the rye smut fungus, *Urocystis occulta*.
Phytopathology 1940 : **30** : 926–35.

Eight selfed lines of rye were inoculated with chlamydospores of the smut and the development of the smut mycelium in the host was investigated. One line of rye was completely susceptible, three were moderately susceptible and four were resistant. The early stages of smut infection was similar in both susceptible and resistant lines. At a later stage in the growth of the seedlings, however, mycelial development is rapid and abundant in the susceptible line and in the resistant lines mycelial development was meagre and retarded.

MAIZE 633.15*

141. Tavčar, A. 633.15:575.061.5:581.45
Nasledivanje dlakavih lisnih rukavaca kod kukuruza (*Zea Mays* L.).
(Inheritance of pubescent leaf sheath in maize).
Proc. Jugoslav. Acad. Sci. Lett., Zagreb 1932 : H.244. [From Arhiv Minist. Poljopr. 1938 : **5** : No. 12 : 168–69].

The author has found three genotypes for pubescence of leaf sheath, (*a*) naked sheath, (*b*) types in which the upper half of the margin of the sheath is covered with hairs 2–4 mm. in length and the remainder of the surface with hairs 0·09–0·14mm. in length, (*c*) types in which hairs of 2–4 mm. length occur on the entire surface of the sheath, interspersed with short hairs as in type (*b*). The pubescence varies to a certain extent with external factors.
Plants of type (*c*) are more drought resistant than the other genotypes.
Crosses between types (*b*) and (*c*) have shown them to differ monofactorially; the factor pair is denoted by *Pu pu*. In the F_1 the number of hairs per unit area and their length were intermediate. By crossing with plants of known genotype the gene *Pupu* has been located in chromosome VII. Its position has been established from crossing-over percentages.

142. Kiričenko, F. G. and
Musiiko, A. S. 633.15:575.12
(Improvement of the quality of the breed in maize seeds).
Jarovizacija 1941 : No. 1 (34) : 37–39.

Increased yields of grain resulted from "supplementary artificial pollination" (with a mixture

* See also Absts 69, 76, 299, 300.

of pollen), which also reduced the percentage of smut infected plants. Particularly good results were obtained when using pollen from plants grown in different places.

143. Bradshaw, I. R. 633.15:575.12(75)
The steady march of southern corn. Southern inbreds crossed with best Corn Belt varieties make high yields in the south.
Sth. Seedsman 1941 : **4** : No. 2 : 8, 24.

Rogers, J. S.
The steady march of southern corn. Experiment station finds inbred native strains produced from 10 to 40 percent more corn than open pollinates.
Ibid 1941 : **4** : No. 2 : p. 9.

The maize hybrids developed for the Corn Belt of the U.S.A. have proved less successful in the southern states.
I. R. Bradshaw reports that promising hybrids have been developed by the Funk Brothers Seed Company for southern conditions by combining inbred lines derived from southern varieties with inbred lines from the Corn Belt.
J. S. Rogers reports that the best combinations developed by the Texas Agricultural Experiment Station are those of different inbreds isolated from Texas varieties. Crosses of Texas inbreds with Corn Belt single cross hybrids yielded better than Corn Belt hybrids but not as well as Texas hybrids and were more susceptible to insect damage.

144. 633.15:575.12(78.1)
Jugenheimer, R. W. 635.677:575.12(78.1)
The Kansas hybrid corn program.
Rep. Kans. St. Bd Agric. 1940 : **59** : No. 236 : 36–47.

The primary objective of the Kansas Corn Project is to develop dent and popcorn hybrids with high yield, resistance to lodging, diseases, insects, heat and drought and having other desirable characteristics. Smut and *Diplodia* dry rot are the most important diseases to which resistance must be sought and drought appears to be the major limiting factor of maize production in Kansas.
Promising inbred lines are selected on the basis of their performance in top-crosses and are then tested in single and double crosses. The preliminary tests in 1939 were carried out at three locations and included 203 top crosses, 318 single crosses and 380 double crosses. The advanced tests, for more promising combinations, in 1939 had 295 entries, planted in 950 plots at 10 different fields. Hybrids showing exceptional promise are tested in the Kansas Corn Performance Tests, on two fields in each of 5 districts, and in co-operative strip tests of which 84 were planted in 1939.
A scheme for multiplication is outlined, starting with 2,000 hand pollinated ears of inbred lines and producing 500,000 bushels of double cross seed, sufficient to plant the 3,000,000 acres of maize grown in Kansas.
The Kansas Agricultural Experiment Station at present prefers to distribute seed of single crosses rather than of inbred lines In this way a hybrid can be promptly withdrawn if necessary.

145. 633.15:575.12:35(78.1)
Hybrid seed corn—binder twine.
Rep. Kans. St. Bd Agric. 1940 : **59** : No. 238 : Pp. 24.

The Kansas hybrid seed corn law, passed in 1939, defines hybrid seed as "the seed of the first generation of a cross involving one or more unrelated, inbred lines of corn, or their combinations." An inbred line is defined as "a line of corn that has been developed as a result of not less than five generations of self-fertilization or its equivalent." Each hybrid must be registered with the State Board of Agriculture before it is sold in Kansas. Registration consists in filing an affidavit of the pedigree, or inbred lines used in producing the hybrid. Another combination must not be sold under the same designation. A list of the hybrids registered by July 1, 1940, is given.
The second part of the publication deals with the Kansas binder twine law.

146. Andrés, J. M. and
Bascialli, P. C. 633.15:575.125
Hibridos comerciales de maiz. Primeros resultados de los ensayos comparativos de rendimiento—Añó 1938–39. (**Commercial maize hybrids. First results of comparative yield tests, 1938–39**).
Inst. Genét., Fac. Agron. Vet., Univ. B. Aires 1940 : **1** : No. 5 : Pp. 20.

Yield tests were made with 97 single crosses together with three control varieties; 31 of the hybrids exceeded the best of the controls, Amarillo Canario Klein, Nos. 4, 5, 10, 44 and 77 giving differences that were significant; these hybrids were conspicuous on account of their vigour and uniformity. Their grain was of the flint type. The best combinations are being carried on for making double crosses and three-way crosses.
The seven best hybrids were all crosses between one North and one South American variety; the next best was a hybrid between two South American varieties from different states. Comparing the results of crosses of different types it was found that from 15 hybrids between two North American types only two (i.e. 13·3%) gave yields exceeding 50 quintals per hectare; from 34 hybrids between North and South American varieties, 8 (i.e. 26·5%) exceeded 50 quintals in yield and from 48 hybrids between two South American varieties only 2 (i.e. 4·2%) exceeded this yield.

147. Hull, F. H.,
Warner, J. D. and
Carver, W. A. 633.15:575.125:575(75.9)
Corn varieties and hybrids and corn improvement.
Bull. Fla Agric. Exp. Sta. 1941 : No. 355 : Pp. 50.

Descriptions are given of maize varieties and of hybrids grown in Florida. The improvement of open-pollinated varieties and the development of hybrids are also discussed. Fla W–1, the first hybrid corn to be released by the Florida Agricultural Experiment Station, and the four inbred lines (11–129, 4–32, B5–11 and B1–18) from which it is produced, are described.

148. Andrés, J. M. and
Bascialli, P. C. 633.15:575.14:575.113
Caracteres hereditarios aislados en maíces cultivados en la Argentina. (**Hereditary characters isolated in maizes cultivated in Argentina**).
Inst. Genét., Fac. Agron. Vet., Univ. B. Aires 1941 : **2** : No. 1 : Pp. 26.

Descriptions are given of a number of aberrant types that emerged when local maize strains were inbred; they include plants with irregular white patches, glossy seedlings, virescent seedlings and various other chlorophyll deficiencies, "lazy" plants, dwarfs of various types, plants with brown midrib, male sterile and unisexual plants, fasciated cobs, broken seeds and various other seed defects. Some of the characters are thought to represent new genes, such as the white patched seedlings, golden leaf, leaves with brown midrib and grains with waxy endosperm.

149. Proičov, G. 633.15:575.14:575.125(47.8)
(**New varieties of maize**).
Zemledelie, Sofia 1938 : **42** : No. 4 : 50–51.

The difficulties of producing "pure lines" of maize are enumerated with observations on how inbred lines may be obtained and the undesirable types of plants that may arise in the process. On the other hand sound plants resistant to unfavourable conditions and giving an adequate set of grain may occur in inbred lines and can be used to obtain an F_1 consisting of tall plants with a high yield of grain. A hybrid of this type is illustrated which gave a yield of 323·500 kg. of grain per dekar (0·247 acres) and a similar instance is cited in which the yield was 373 kg. per dekar. The process of continuous selection and crossing necessary to obtain such vigorous and high yielding hybrids is regarded as unsuited to Bulgarian conditions where large numbers of very small farms grow maize. The Obraztsov Experiment Farm, however, is investigating "synthetic varieties" produced by mass crossing of large numbers of lines, as such hybrids may prove more resistant to degeneration in subsequent generations as well as high yielding.

150. Kempton, J. H. and
Maxwell, L. R. 633.15:575.243:537.531
Effect of temperature during irradiation on the X-ray sensitivity of maize seed.
J. Agric. Res. 1941 : **62** : 603–18.

Seeds of Funk Yellow Dent were given X-ray dosages of 30 to 45 kr. at temperatures ranging from —187° C. to 66° C. The heights of plants and the percent survival of seedlings were used as an index of the effect of the X-ray treatment. It was found that the maximum sensitivity of seeds to the treatment occurred for the temperature range 0° C. to room temperature. The observed decrease in sensitivity at the extreme temperatures cannot be explained on the basis of recovery from injury to the chromosomes as the material was in the resting stage when treated.

151. Anderson, E. and
Erickson, R. O. 633.15:576.16:575.127.5:575.115
Antithetical dominance in North American maize.
Proc. Nat. Acad. Sci. Wash. 1941 : **27** : 436–40.

It is suggested that a logical extension of the hypothesis of Mangelsdorf and Reeves (see "Plant Breeding Abstracts", Vol. X, Abst. 760) that North American maize is somewhat contaminated with *Tripsacum* (this hypothesis is now called the hypothesis of antithetical dominance by the present authors) will account for many of the genetic peculiarities of *Zea mays*. The hypothesis of antithetical dominance can be stated in general terms as follows: "in hybrids between extremely diverse parents, natural selection will tend to encourage those modifiers favouring one parental extreme or the other and suppressing intermediates". To test this hypothesis a careful study of various maize inbreds with reference to the morphological characters which distinguish *Zea* from its close relatives was made. A considerable number of the inbreds have tended to show a combination of characters which is characteristic of most species of *Tripsacum* but which is rare in North American maize and unknown in maize from Peru and Bolivia (the latter being on the Mangelsdorf and Reeves hypothesis the only maize uncontaminated with *Tripsacum*). These Tripsacoid characters disappeared when the inbreds were crossed. It is also suggested that the whole question of inbreeding effects in maize needs to be restudied in the light of the hypothesis of antithetical dominance.

152. Anderson, E. G. 633.15:576.356.2:575.116.1
Translocations in maize involving the short arm of chromosome I.
Genetics 1941 : **26** : 452–59.

The linkage relationships of eight translocations involving chromosome I with the genes *sr*, *P* and *br* have been ascertained. The cytological position of five of the translocations is also given.

153. Burnham, C. R. 633.15:581.162.5:575.116.1
Cytogenetic studies of a case of pollen abortion in maize.
Genetics 1941 : **26** : 460–68.

A new gene, *pa*, has been discovered, its only effect being to make inviable all, or nearly all, pollen grains carrying it. Plants heterozygous for *pa* are therefore semi-sterile in the pollen but fully fertile in the ovules. Linkage studies show that it lies in chromosome I between *P* and *br*, thus: *P*–30–*pa*–34–*br*. The gene *pa* upsets the segregation of genes linked with it when heterozygous plants are used as pollen parents, though the effect of *pa* is not always what is expected.

Pachytene studies failed to disclose any visible abnormality of the chromosomes, though the possibility of a minute deficiency cannot be excluded.

154. Marino, A. E. and
Luna, J. T. 633.15:581.46:578.088
Análisis estadístico del número de hileras en espigas de maices comerciales. (**Statistical analysis of number of rows per cob in commercial maize varieties**).
Rev. Argent. Agron. 1941 : **8** : 131–37.

Statistical analyses were made of the number of rows per cob in seven maize varieties in the years 1937–39. The varieties could be classified into those with an average of 8, 11, 13 and 15

rows respectively but certain varieties showed less variation from year to year than others; thus Canario Klein had over 80% of its cobs with 8 rows, with a coefficient of variation of 10·88% in the 3 years. Some of the differences between varieties are significant and can be used as distinguishing features.

155. Jones, D. F. 633.15:581.483:575.243:537.531
Natural and induced changes in chromosome structure in maize endosperm.
Proc. Nat. Acad. Sci. Wash. 1941 : **27** : 431–35.

Using the marker genes *C* and *Pr* for aleurone colour and *Su* for normal versus sugary endosperm, the loss of single dominant genes and the number of single and paired recessive areas were determined in heterozygous maize seeds without treatment and with different dosages of X-ray treatments. The results show that in the untreated material there are significant differences between families in the natural occurrence of chromosome breaks and rearrangements, that in the treated material chromosome exchanges have been increased much more than the deletions (this supports the breakage-first hypothesis), and that in the treated material there are marked differences in the mutation rate in different families. These differences must depend upon internal differences peculiar to the organism.

156. Clark, D. G.,
Hecht, H.,
Curtis, O. F. and
Shafer, J. I. (jun.) 633.15:581.49:631.557
Stomatal behaviour in inbred and hybrid maize.
Amer. J. Bot. 1941 : **28** : 537–41.

The stomatal condition of the leaves of a number of inbred lines, single and double crosses and commercial varieties of maize were determined throughout the day by the cobalt chloride paper method. The stomata of the high yielding types were found to open earlier in the morning and to remain open later in the afternoon than did those of the low yielding types. Reciprocal crosses showed no differences in stomatal behaviour.

BARLEY 633.16*

157. Khod'kov, L. E. 633.16:575"793":581.143.26.03
(The appearance of "winter" and "semi-winter" plants in the progeny of a cross between spring cereals).
Jarovizacija 1941 : No. 1 (34) : 47–49.

In the F_2 of a cross of two spring barleys, *Hordeum vulgare* var. *Dundar-beyi* Zhuk. x *H. v. trifurcatum* Schl., there appeared a number of winter and semi-winter forms, varying in proportion from $\frac{1}{9}$ to $\frac{1}{3}$ of the total population. When the F_1 seeds were sown in spring, out of 116 plants only 13 behaved as true spring forms, producing mature grain. After vernalization however the proportion of plants to yield grain was distinctly higher.
It is concluded that the character of the F_2 plants is a consequence of the conditions under which the F_1 plants were grown. To test this the cross was repeated and some of the F_1 plants were grown at +3 to +8° C. and others at +18 to +24° C. The progeny of the warm plants came into ear some time later than those of the cold plants when both were grown side by side in the open. Growing F_2 plants at different temperatures on the other hand had little or no effect on their progeny.

158. Woodward, R. W. 633.16:575.11.061.6
Inheritance of a melaninlike pigment in the glumes and caryopses of barley.
J. Agric. Res. 1941 : **63** : 21–28.

This paper presents the results of a study of the inheritance of the black or melaninlike pigment that occurs in various intensities in the glumes and caryopses of barley in some 8,000 F_3 progenies from more than 50 crosses. The varieties were classified into five groups—dense black, black, medium black, grey and white. Dense black and black could not be distinguished in progenies from crosses between them. The medium-black group appeared to be

* See also Abst. 69.

distinct from the others but its genetical relationship could not be established. The F_2 segregations based on F_3 breeding behaviour suggest that black, grey and white belong to an allelelomorphic series of factors, the denser colour always being completely dominant over the lighter one. The factors are *B*, B^g and *b* for black, grey and white respectively.

159. 633.16:576.356.5
MÜNTZING, A. 633.16:537.531:575.243
Differential response to X-ray treatment of diploid and tetraploid barley.
Acta Univ. Lund 1941 : **11**(6) : Pp. 10.
Seeds of diploid and autotetraploid lines of Opal B barley were irradiated with several dosages of X-rays and the percentage germination, the percentage of plants dying before maturity, the percentage of plants with spikes and the fertility of plants determined for controls and the irradiated material. In the tetraploid material the germination of the treated seeds and the vigour of the resulting plants was on the average much less decreased than in the corresponding diploids. Also the average decrease in fertility in the tetraploids was less pronounced than in the diploids. These differences in susceptibility to X-rays were not due to different water contents of the two types of seed. It is suggested that the autotetraploid line is more resistant to X-rays because it has four entirely homologous genoms instead of only two as in the diploid.

160. KARTAMYŠEV, V. 633.16:582:575.3
(Many rowed barley).
Jarovizacija 1940 : No. 6 (33) : 109–10.
It is pointed out that the number of rows of fertile florets is a character subject to modification under the influence of manuring and other environmental factors.

161. TAKAI, Y. 633.16–2.111–1.521.6:575(52)
(Production of "Barley New No. 1" intended for snowy districts).
Plant Breed. News 1934 : 2683–87.
Barley New No. 1 was bred by the Niigata Experiment Station to meet the need for a cold resistant variety in Niigata Prefecture. It was obtained from the cross Taisho-Mugi x Hadaka-Rikuu No. 1 in the F_9. From the pistillate parent the hybrid has inherited earliness, and from the pollen parent resistance to snowy conditions; it has a short stem, abundant tillers and its longish grain is of fairly good quality.

MILLETS AND SORGHUM 633.17*

162. 633.174(77.7)
Tests show "New Grain" is not superior sorghum.
Seed World 1940 : **48** : No. 11 : 17–19.
A variety of sorghum being offered at fancy prices under the name New Grain is, according to C. P. Wilsie of Iowa State College, 20 to 25% lower in forage yield than Atlas sorgho and too late in maturity to produce good quality seed in central Iowa. It appears to be identical with Grohoma, a variety for which claims were made which were not substantiated in tests.

RICE 633.18†

163. 633.18:575(91.1)
State of North Borneo. III-Production. 1. Agriculture.
H.E. Governor's Administr. Rep. St. N. Borneo 1939 : Pp. 5.
The padi-growing tests and demonstration plot established at Penampang in 1938 continued experimental work on the selection of pest resistant and high yielding strains of wet padi.

164. NAKAYAMA, K. 633.18:575.11–181
(Comparative studies on the panicle development in normal and dwarf types of rice plant).
Jap. J. Genet. 1940 : **16** : 139–48.
A further study of the action of the genes *A* and *B* for dwarf habit in rice (cf. "Plant Breeding

* See also Abst. 69 (Sorghum). † See also Absts 69 and 99.

Abstracts", Vol. VIII, Abst. 513). It is found that the panicles of the two larger types *AABB* and *AAbb* begin to develop and differentiate the branch primordia of the first order earlier than those of the *aaBB* and *aabb* types. The branches of the second order in panicles appear in all types at the same time. The primordia of lemma and palea are formed in the types *AABB* and *AAbb* earlier than those in types *aaBB* and *aabb*. It is concluded that in the early stages of development the greater length of the panicles in the larger types is caused by the more active cell divisions and the more advanced development of cells so formed and not by the larger dimensions of the cells.

165. SAKAI, K. 633.18:576.354:576.356
(Chromosome studies in *Oryza sativa* L. II. An unexpected asynapsis of the pollen mother-cell chromosomes).
Jap. J. Genet. 1940 : **16** : 193–202.

Univalents were observed in pollen mother cells of three varieties of rice. At first metaphase the percentage of cells with no univalents was about 50% in one variety, about 60% in another and 85% in the third. The number of univalents per cell varied from 2 to 18–24. Thus in fixation No. 168 of the variety Chôsun-Mûbo 50% of the cells had no univalents, 15·4% two, 7·9% four and 26·9% six or more and in fixation No. 169 of the same variety 45% had no univalents, 30% two, 13% four and 11% six or more. The distribution of the univalents at first metaphase suggests that there is an attractive force between the two homologous but unpaired univalents.

166. OKURA, E. 633.18:576.356.5:575.12:576.356
[Diploid F_1 hybrids produced from the cross between tetraploid and diploid race in *Oryza sativa*, L. (Preliminary note)].
Jap. J. Genet. 1940 : **16** : 228–33.

Crosses between an autotetraploid rice plant ($2n = 48$) and a diploid ($2n = 24$) produced F_1 hybrids which were all diploids and combined characteristics of both parents. It is suggested that this result can only be explained on the hypothesis that elimination of a genom occurs during macrosporogenesis in the tetraploid parent.

FORAGE GRASSES 633.2*

167. 633.2:575(73)
AAMODT, O. S. 633.3:575(73)
Report of the First Southern Pasture and Forage Crop Improvement Conference July 23 and 24, 1940.
Tifton, Georgia Pp. 20. (Mimeographed).

The conference included a discussion on breeding problems; for a review see "Herbage Abstracts".

168. WEXELSEN, H. 633.24:575.061.634:575.14
Chlorophyll-deficient seedlings in timothy (*Phleum Pratense* L.).
J. Hered. 1941 : **32** : 227–31.

Chlorophyll deficient seedlings of the following types—albino, yellow, yellowish white with green streaks, yellow green and light green—were found in inbred families of hexaploid timothy ($2n = 42$). Normal green is completely dominant to all types of chlorophyll deficiency and 3 : 1, 15 : 1 and 63 : 1 ratios were obtained. Calculations are also made of the frequency of plants heterozygous for chlorophyll deficiencies in a Norwegian timothy strain and of the probable amount of spontaneous selfing in open-pollinated single spaced plants of this strain. It is suggested in an editorial note that the genetical ratios in some families can be explained on the basis of tetrasomic inheritance.

169. NORDENSKIÖLD, H. 633.24:576.356.5:575.127.2:576.354.4
Cytological studies in triploid *Phleum*.
Bot. Notiser 1941 : No. 1 : 12–32.

Meiosis in haploid *P. pratense* ($2n = 21$), in triploid *P. nodosum* ($2n = 21$) and in the triploid hybrid ($2n = 21$) between *P. nodosum* ($2n = 14$) and *P. alpinum* ($2n = 28$) is described. Pollen mother cells in haploid *P. pratense* usually show marked signs of degeneration. Syncyte

* See also Abst. 71 (Grasses); Absts 120–1 (Agropyron).

formation also occurs. The usual metaphase association is 7 bivalents plus 7 univalents. Trivalents only occur in a few cells. In the triploid hybrid *P. nodosum* x *P. alpinum* each cell contained on an average at metaphase 2·63 trivalents, 4·60 bivalents and 3·43 univalents. In 34% of the cells the sum of bivalents and trivalents was eight and in 12% of the cells associations of four chromosomes occurred. In triploid *P. nodosum* each cell contained on an average 2·03 trivalents, 5·13 bivalents and 4·68 univalents. No associations of four chromosomes were observed and in only 10% of the cells was the sum of bivalents and trivalents eight. The triploid *P. nodosum* showed a low female fertility but the other two types of triploid were completely sterile. The chromosome numbers of plants from the cross triploid *P. nodosum* ($2n = 21$) x *P. pratense* ($2n = 42$) were counted. Of the 59 plants investigated, 20 had $2n = 42$, 13 had $2n = 40$ and 12 had $2n = 33$ to 37. The plants resembled *P. pratense* and their fertility was good. Meiosis was investigated in a few plants and it was observed that mostly bivalents occurred. Tetrad formation was quite regular. From the cross triploid *P. nodosum* x diploid *P. nodosum* a single plant which had the chromosome number $2n = 20$ was obtained.

170. Nilsson, F. 633.264:575.127.2:576.312.35

The hybrid *Festuca arundinacea* x *F. pratensis* and some of its derivatives.

Bot. Notiser 1940 : No. 1 : 33–50.

The F_1 hybrids were morphologically intermediate between the parent species. They produced a very small number of good pollen grains and were found to be female sterile when isolated. Seeds were, however, obtained from open pollinations and the progeny from such pollinations has been studied. The chromosome numbers, the pollen fertility, the seed setting, the date of panicle exsertion, the plant height and the type of plant are given in a table for 38 plants of these progenies. The chromosome number of *F. pratensis* was found to be $2n = 14$, of *F. arundinacea* $2n = 42$ and of the F_1 hybrids $2n = 28$. Meiotic studies of the F_1 hybrids showed that they formed 7 bivalents + 14 univalents in most cells. Restitution nucleus formation was also observed. In the progenies by open pollination, two plants had $2n = 35$, two plants $2n = 42$, twenty-nine plants $2n = 49$, three plants $2n = 63$ and two plants $2n = 77$. Plants with $2n = 77$ were the most fertile.

171. Östergren, G. 633.289:575.127.2

On the morphology of *Agropyron junceum* (L.) PB., *A. repens* (L.) BP. and their spontaneous hybrids.

Bot. Notiser 1940 : No. 2 : 133–43.

The morphology of the two types of hybrids between *A. junceum* x *A. repens*, the cytology of which was discussed in a previous paper (see "Plant Breeding Abstracts", Vol. XI, Abst. 145), is described. The hybrids with $2n = 35$ are more or less intermediate between *A. junceum* ($n = 14$) and *A. repens* ($n = 21$). The hybrid with $2n = 49$ resembles *A. junceum* more than *A. repens* as is to be expected since it contains two gametic chromosome sets from *A. junceum*.

LEGUMINOUS FORAGE PLANTS 633.3*

172. Atwood, S. S. 633.322:581.162.5:581.331.2

Cytological basis for incompatibility in *Trifolium repens*.

Amer. J. Bot. 1941 : **28** : 551–57.

The rate and percentage of pollen germination and the growth of pollen tubes were studied in compatible and incompatible pollinations of white clover. The rate and percentage of germination, as well as the initial rate of pollen tube growth, were greater in the compatible than in the incompatible crosses. The two types of compatible cross (S_1S_2 x S_3S_4 and S_1S_2 x S_1S_3) were distinguishable by the rapid germination of all or only part of the pollen. Both compatible and incompatible pollen tubes are slowed down in growth one hour after pollination when the longest tubes have grown three-quarters of the distance down the style but compatible tubes to a lesser extent. No incompatible tubes were seen to enter the ovary. Some compatible tubes had entered the ovary three hours after pollination and fertilization was effected after eight to ten hours. White clover thus has the growth of incompatible pollen inhibited at two zones, one on the stigma and the other in the style.

* See also Abst. 71 (Lucerne).

173. Hartwig, E. E. 633.366:575.11
A new mutant leaf character in sweet clover.
J. Hered. 1941 : **32** : 171–72.

Unifoliolate leaf plants were obtained in the selfed progeny of a single plant. Genetical studies show that the unifoliate character is due to a single recessive factor.

ROOTS AND TUBERS 633.4*

174. Olsson, P. A. 633.42–2.412.5–1.521.6:575(48.5)
Klumprotsjuka (*Plasmodiophora brassicae* Wor.) på rovor och kålrötter samt åtgärder mot densamma, speciellt ur växtförädlingssynpunkt. II. Fortsatta undersökningar samt försök med resistansförädling. [**Club root disease (*Plasmodiophora brassicae* Wor.) in turnips and swedes and the means of control, especially by plant breeding. II. Further investigations, and experiments in breeding resistant strains**].
Sverig. Utsädesfören. Tidskr. 1940 : **50** : 287–360.

A full account of the results for 1937–39 of experiments made by the Swedish Seed Association (Sveriges Utsädesforening) on the production of club root resistant varieties of swedes and turnips by selection and hybridization. In describing the technique the use of artificial light to hasten seed production in these two crops is mentioned.

The results showed not only clear hereditary differences between the various strains in their resistance to the disease—but also progressive increases in resistance after repeated selection in the infected soils.

In the 1939 experiments selected lines and numerous strains from various crosses were used. Svalöfs Majrova [May turnip] 8020 and some selected lines from Majrova were resistant and further evidence of the efficacy of the selection work was afforded by a line from the Bortfelder x Mainaepe cross, though another selection from the same cross showed no improvement. The resistance of strain 8046 (from the Dales Hybrid x Mainaepe cross) and of a line derived from Bortfelder x Dales Hybrid (8058) also showed increased resistance as compared with previous years. Other hybrids favourably mentioned were: one from an F_4 selection of Bortfelder x Mainaepe, crossed with an F_1 plant from (Bortfelder x Mainaepe, F_4) x (Östersundom x Mainaepe, F_4); an Östersundom x Mainaepe line from the Västgötaland Sub-station; and especially some lines from an original selection (three generations back) from Majrova J. 013 which showed a stand of over 95% fresh apparently sound plants on both clay and peat soils in 1938.

Of particular interest is the cross (Bortfelder x Mainaepe, 8262/38) x (Bortfelder x Dales Hybrid 8260/38), since in one parental line the resistance has been introduced by Mainaepe and in the other by Dales Hybrid and transgressive segregation can therefore be hoped for in the later generations.

Among the swedes, resistance was on the whole very low and evidently quite ineffective on severely infected soil. An attempt was made to increase resistance by crossing with the more resistant lines of turnips (e.g. Bangholm, strain 05 and Majrova, strain J. 013); but sterility in the progeny gave considerable difficulty; and only by crossing plants with individual swede plants obtained from a few lines and specially selected as flowering at the same time as the turnip parents was some seed obtained for further experimentation.

The experiments recorded in this report have confirmed the hereditary nature of club root resistance in turnips and in swedes and the possibility of intensifying such resistance by natural selection operating through repeated cultivation on infected soil. Moreover, the degree of resistance ultimately attained may considerably exceed that of the original population.

The question of the possible existence of biological races of *Plasmodiophora brassicae* is raised (cf. "Plant Breeding Abstracts", Vol. III, Abst. 358) and the need for testing resistant selections with infective material of different provenance. Some tests of this nature have already been made with Majrova J. 013 at the Västgöta Sub-station.

The question of yield must also receive attention with a view to eliminating any ill effects of inbreeding caused by hybridization of the inbred lines (cf. also "Plant Breeding Abstracts", Vol. X, Abst. 781).

* See also Absts 60–1 (Fodder beet); Absts 71, 82 and 87 (Potato); Abst. 95.

175. PROPACH, H. 633.491:575.127.2:576.354.4
Cytogenetische Untersuchungen in der Gattung *Solanum*, Sect. *Tuberarium*. V. Diploide Artbastarde. (**Cytogenetical investigations in the genus *Solanum*, sect. *Tuberarium*. V. Diploid species hybrids**).
Z. indukt. Abstamm.- u. VererbLehre 1940 : **78** : 115–27.

The following diploid ($n = 12$) varieties were crossed:—*S. verrucosum* Schlechtd., *S. Vavilovii* Juz. et Buk., *S. polyadenium* Greenm., *S. Jamesii* Torr., *S. chacoense* Bitt., *S. Henryi* Buk. et Lechn. and a yet undescribed wild Argentine species which is known by its local name of "papa chusa". Cool, moist weather was most favourable for successful pollination.

1 and 2. *S. verrucosum* ♀ x *S. chacoense* ♂ "Bukasov" and "Agraciada". The F_1 hybrid has the luxuriant growth of *S. chacoense* and is self-sterile but gives a fairly good set when pollinated by other F_1 plants. No disturbances were observed in the pollen-mother cells of first metaphase.

3. *S. verrucosum* ♀ x *S.* sp. "papa chusa" ♂. The growth of the wild species is upright and moderately strong. The leaves are very hairy and of a light grey-green colour. It is self-sterile. The F_1 is intermediate and no abnormalities were observed in the pollen-mother cells during meiosis.

4. *S. polyadenium* ♀ x *S. Jamesii* ♂. The F_1 most closely resembled the maternal species. In 50 pollen-mother cells only two univalents were seen but no F_2 could be obtained.

5. *S. chacoense* "Paraguay" ♀ x *S.* sp. "papa chusa" ♂ and reciprocal. The F_1 hybrid was the same in both direct and reciprocal crosses and most nearly resembled *S. chacoense*. No disturbances were observed at meiosis and the fertility was good.

6. *S. Henryi* ♀ x *S. verrucosum* ♂. The F_1 was intermediate and meiosis was regular.

7. *S. Henryi* ♀ x *S. Vavilovii* ♂. The F_1 was weakly and though meiosis was normal no F_2 could be obtained.

8. *S. Henryi* ♀ x *S. chacoense* "La Pampa" ♂. The F_1 plants were so weakly they died before flowering.

9. *S. Henryi* ♀ x *S.* sp. "papa chusa" ♂. The results were the same as the foregoing.

From these results it must be concluded that the species genoms concerned must be homologous. Some data are also given on the inheritance of flower colour which suggest, among other things, that there are two different factors for white flower colour. R. M. I.

176. GLUŠČENKO, I. E. 633.491:575.3
(**Genotypical variation of the potato resulting from conditions of growth**).
Jarovizacija 1940 : No. 6 (33) : 98–101.

The yield of potatoes grown in the Moscow area from "seed" (tubers) from summer plantings in the south was considerably higher than that from locally grown seed and from seed grown in spring in the south. From this it is argued that the hereditary nature has been altered by summer planting.

177. 633.491:576.312.35
RATERA, E. L. 633.491:576.356.5
Determinación del número de cromosomas de los Solanum aculeados de los alrededores de Buenos Aires. (**Determination of the chromosome number of the aculeate Solanums from the environs of Buenos Aires**).
Inst. Genét. Fac. Agron. Vet., Univ. B. Aires 1940 : **1** : No. 6 : Pp. 7.

The species in question are *S. bonariense* L., *S. eleagnifolium* Cav., *S. meloncillo* Par., *S. platense* Dieck. and *S. sisymbriifolium* Lam., all belonging to the section Leptastemonum. They are briefly described.

The chromosome numbers were determined in pollen mother cells by the acetocarmine method; the haploid number in *S. eleagnifolium* was $n = 36$, in *S. meloncillo* $n = 24$ and in all the others $n = 12$. The species of this section thus form a polyploid series analogous to the sections *Tuberarium* and *Morella*.

178. STELZNER, G. 633.491:576.356.5:581.04
Colchicininduzierte Polyploidie bei *Solanum tuberosum* L. (**Colchicine-induced polyploidy in *S. tuberosum* L.**).
Züchter 1941 : **13** : 121–28.

Doubling of the chromosome number of the potato by colchicine treatment of the seeds is

stated to be relatively easy, immersion in 0·1 to 0·4% solutions for four days giving the best results; injury to the roots is reduced by using germinated seeds.
For breeding purposes, however, it was considered that doubling the chromosomes of commercial varieties was likely to give more promising results and this was achieved by the following procedure. Tubers were sprouted in the dark and all but the strongest sprout removed. The roots and tubers were wrapped in paper and the sprout was immersed for one-third of its length in 0·6 to 0·8% colchicine solution in a desiccator. The desiccator was evacuated for five minutes and then the pressure was allowed to return slowly to normal, thus infiltrating the growing point with colchicine solution. The tubers were then planted out and all shoots other than the main one were suppressed. Cuttings were taken from promising plants for the production of tubers. In this way four octoploid ($2n = 96$) strains were produced, one from Konsuragis (No. 1) and three from Pepo (Nos. 2, 3 and 4). Others have since been produced from other varieties.
These strains were grown from tubers in pots in the open and in an experiment to compare them with their parent tetraploid varieties. At first no differences were evident but later strains 2 and 3 fell about a month behind the tetraploid controls, while 104 grew as rapidly as the controls. The octoploids produced less shoots, mostly having only one, with a strong tendency to produce short side shoots. The leaves and leaflets were shorter and thicker and less regular in form. The flower stalks were shorter and more compressed, with thicker buds than in the controls. The broad and compressed anther cone was very conspicuous. Strains 2 and 3 showed the most irregularity in their development, strain 1 showed less and strain 4 relatively little. The octoploids had shorter stolons but their tubers were about the same. Yields were very variable; on the average octoploid Pepo yielded about half as much as the tetraploid, the average weight per tuber and starch content being about the same.
The areas of the epidermal cells, of palisade cells in sections of the leaflets and of parenchyma cells in sections of the tuber were compared in octoploids and tetraploid. For epidermal cells the ratio tetraploid : octoploid was 1 : 1·4, for palisade cells 1 : 2·4 and for parenchyma 1 : 1·4. Though the pollen grains of octoploids were somewhat larger the distinction was of little use for the detection of polyploidy owing to the large proportion of aborted grains.
The fertility of the octoploids was very low and from 46 pollinations only four seeds were obtained.

179. Ratera, E. L. 633.491:581.331.2
Contribución al estudio del polen de papas. Observaciones en algunas variedades de papas cultivadas y en especies salvajes afines. (**Contribution to the study of potato pollen. Observations on certain varieties of cultivated potatoes and on related wild species**).
Inst. Genét. Fac. Agron. Vet., Univ. B. Aires 1940 : **1** : No. 4 : Pp. 19.
The pollen was stained with Lugol solution or acetocarmine; the germination of the pollen in a sugar agar solution was also determined. The results are reported in respect of the following species: *Solanum laplaticum, S. Parodii, S. Horovitzii, S. gibberulosum, S. Garciae, S. chacoense* and various forms of *S. tuberosum.*
The wild species, with the exception of *S. laplaticum,* had a high percentage of fertile pollen, domestic varieties a low percentage. Three domestic varieties, Katahdin, Hungara (Hungarian) and Alma had abundant pollen. No germination at all was obtained in the pollen of Green Mountain and Norteamericana (North American).

180. Bukasov, S. M. 633.491:581.9(8)
The geography of the endemic potatoes of South America.
Rev. Argent. Agron. 1941 : **8** : 83–104.
A geographical and ecological classification of both the wild and cultivated S. American species of potatoes collected by the Soviet expeditions is given. The wild species, considered in the first part of the article, are split up into 11 ecological-geographical groups and the cultivated Andean species, considered in the second part, into 7 such groups. Details are given of the climatic characteristics of the regions in which the different groups occur. In some cases the groups are divided into zones. Thus the Bolivian-South Peruvian frost-resistant group of cultivated species comprises an upper zone occupied by *S. Juzepczukii* (the most frost-resistant of all cultivated species) and a lower zone where the less frost-resistant species, *S. ajanhuiri* and *S. curtilobum,* are grown.

181. Müller, K. O. and
Orth, H. 633.491:581:575(43)
Über einen Spätpflanzversuch mit Kartoffeln. (**On a late planting experiment with potatoes**).
Ernähr. Pfl. 1941 : **37** : 37–40.

The problem of late planting of potatoes in Germany after winter catch cropping and its economic value are discussed. If such a rotation is to pay, a suitable variety of potato must be used, the essential characteristics of which must include: rapid growth; resistance to *Phytophthora*, satisfactory growth of the tubers under short day conditions, and little tendency of the stored tubers to soften, or to become stringy during germination.
The variety BRA 5/31 noticed by K. O. Müller in breeding *Phytophthora* resistant types appeared to possess the required characteristics and on being tested in a late planting experiment gave good results.
The relation between manuring and the chemical content of the tubers was also studied, as well as the relation between the arginine content of the tubers and leaves and resistance to disease.

182. Holmberg, C. 633.491–2.412.5–1.521.6:575(48.5)
Potatiskräftans bekämpande och potatisssortfrågan. (**Combating potato wart and the question of potato variety**).
Lantmannen 1941 : **25** : 195–98.

Wart immune varieties are enumerated, including Dukker (a Norwegian potato), Rosafolia (which is resistant to disease during storage), Direktor Johannsen and several varieties used for feeding livestock or manufacturing purposes.
Svalöf is now engaged in breeding wart resistant varieties at the wart disease laboratory of the Plant Protection Institute and in future new varieties from Svalöf should be immune.

183. Jensen, J. H. and
Goss, R. W. 633.491–2.484–1.521.6:575
Infection of first-year potato seedlings with *Fusarium solani* var. *eumartii*.
Amer. Potato J. 1941 : **19** : 239–42.

Potato seedlings, about 1 to 2 inches tall, can be tested for resistance to *F. solani* var. *eumartii* by transplanting them into infected soil. Six crosses were tested by this means and second and third year tests were made of the surviving clones. Some susceptible seedlings evidently escaped infection in their first year as is shown by the second year tests. In the third year test 12 clones comprising 53 plants produced 221 tubers, only one of which showed symptoms of wilt. The check units of Triumph and Cobbler averaged about 20% infection.

184. Schultz, E. S.,
Clark, C. F. and
Stevenson, F. J. 633.491–2.8–1.521.6:575.1
Resistance of potato to viruses A and X, components of mild mosaic.
Phytopathology 1940 : **30** : 944–51.

In field exposure to infection by virus A, 47% of seedlings from the cross No Blight x Katahdin, 14% of seedlings from Katahdin x Earlaine and 46% of seedlings from Russet Rural x S 24642 became infected. In the same tests the varieties Green Mountain, No Blight and Russet Rural became 100% infected while Katahdin, Earlaine and S 24642 showed no infection. Fifty-four of the seedling varieties, which did not become infected in the field tests, all contracted virus A by grafting. Katahdin also shows this behaviour, being immune to virus A by aphid infection but susceptible by grafting.
In field exposure to infection by virus X, 30% and 34% of seedlings from S 41956 x Katahdin and 62% of those from S 41956 x Earlaine became infected. In the same tests Green Mountain, Green Mountain Seedling and Earlaine showed 100% infection, Katahdin 16% or no infection and S 41956 no infection. The higher percentage of seedlings infected with virus X in the progeny S 41956 x Earlaine than in S 41956 x Katahdin is probably connected with the fact that Earlaine is more easily infected with virus X in the field than is Katahdin. Previous work has shown that 37% of the seedling varieties from virus X immune 41956 x virus X susceptible Katahdin are virus X immune by graft infection (see "Plant Breeding Abstracts",

Vol. IX, Abst. 1099). Some of the 66% of seedlings from the Katahdin cross which did not become infected after two years in the field, are therefore probably susceptible types which resemble Katahdin in that they show some resistance to infection by virus X in the field. The seedlings which are virus A immune in the field react like Earlaine with tuber and top necrosis to infection by grafting with virus A.

FIBRES 633.5*

185. 633.51:575(81)

Cotton productivity in the State of São Paulo.
Bull. Chamb. Comm., S. Paulo 1939 : No. 24.

The article refers to experiments with selected U4 cottons from South Africa which gave greatly increased yields in comparison with the types of Upland generally grown in the State of São Paulo. The opinion is given that these types of U4 are likely to solve the problem of poor productivity in certain districts where the Express-Texas varieties have been previously grown.

186. Bereznjakovskaja, A. V. 633.51:575.3"793"
(**Production of early maturing Sea Island cotton**).
Jarovizacija 1941 : No. 1 (34) : 40–46.

Sea Island plants were grown under cover but were subjected to low temperatures during the first stage of phasic development. The first generation progeny contained various anomalous forms, including some dwarfs which ripened very early, before the beginning of the frosts. These plants also had bolls which opened wide as in Upland cotton. Variation occurred in the entire population in respect of time of maturity. The 51 best plants were selected and their progenies were studied separately. Variation was again observed in time of maturity, some lines being up to 29, and odd ones even 35–40 days earlier than the control. The progeny of the dwarf plants were normal in habit and typical Sea Island plants but were the earliest of all in maturity, some of them ripening 29 days before the control; when sown in the open on 20th April they ripened in 130–140 days.

The treatment was applied again to some of these second generation plants; the progeny proved distinctly hardier than untreated plants, early in flowering by 1–19 days and in ripening by 2–3 weeks. In ripening they were simultaneous with the Egyptian cottons. As regards other characters, including the quality of the lint, the plants were indistinguishable from ordinary Sea Island.

187. Harland, S. C. 633.51:576.16
A história da evolução dos algodões cultivados do novo mundo. (**The history of the evolution of the cultivated cottons of the New World**).
An. Primeira Reunião Sul-Amer. Bot. (1938) 1939 : **1** : 215–25.

Reference is made to the transference of the gene for red leaf from a diploid species (*Gossypium arboreum*) to a tetraploid (*G. barbadense*), where it proved to be a new member of an existing allelic series. New World wild diploids of the groups *Armourianum, Harknessii, aridum* and *trilobum* have also been shown to possess homology with the tetraploid group. Cytological evidence is adduced in support of the view that these two groups of diploids represent the respective ancestors of the tetraploid New World group. The union is thought to have occurred when there was land connexion between the Pacific coast and Malaya, thus probably in the Cretaceous. Relics of other tetraploids have remained on the islands such as Hawaii and Fiji, the only parts of this land connexion that have not been submerged. *G. barbadense* was apparently domesticated by the Incas, *G. hirsutum* by the Aztecs and *G. punctatum* (= *G. Hopi* Lewton) by the N. American Indians, the tropical monopodial (tree) forms being the original types. The greatest concentration of genes of *G. barbadense* has been found by the author in the valley of Cauca in Colombia, which is therefore regarded as the probable centre of origin of this species. The corresponding centres for *G. hirsutum* and *G. punctatum* would appear to be southern Mexico; the centre for *G. purpurascens* remains doubtful. This last-named species is thought to have great possibilities for breeding, since it is adapted to an unusually wide range of climatic conditions and has lint of first-rate quality.

* See also Absts 69 and 73 (Cotton).

188. STROMAN, G. N. 633.51:581.162.5:575.11
A heritable female-sterile type in cotton.
J. Hered. 1941 : **32** : 167–68.
A common form of "rogue" in Acala No. 8 cotton is a type that has no bolls and is very tall. Segregations in the progenies of normal plants approximate to 3 normals : 1 sterile.

189. 633.51:581.162.31
KRASOVSKII, I. R. 633.51:575.12:575.148
(Influences of enforced self-pollination in cotton on fruiting and yield).
Jarovizacija 1941 : No. 1 (34) : 104–06.
Seed from plants of a number of varieties of *Gossypium hirsutum* that had been artificially self-pollinated for a number of years was compared with seed from the same varieties open-pollinated. The plants of the control were taller, flowered 2–3 days earlier and ripened sooner; they had a greater number of bolls per plant and of seeds per boll, especially in comparison with the varieties that had been selfed for longer periods.

190. NEAL, D. C. and
BROWN, H. B. 633.51–2.484–1.521.6(76.3)
Wilt resistance of the new cottons.
Better Crops with Plant Food 1940 : **24** : No. 10 : 16, 46.
The percentage infection by *Fusarium vasinfectum* and the yield of seed cotton are shown for eight new strains and three F_5 hybrid lines grown in a wilt-resistance test in comparison with the susceptible variety Half and Half. The infection ranged from 0·4% for Delfos 925–425 to 87% for Half and Half. Deltapine 12 gave the highest yield, while ranking third in resistance.

191. FAHMI, T. 633.51–2.484–1.521.6:575
(A technical method of selection in cotton for immunity against wilt).
Egypt. Agric. Rev. 1941 : **19** : 6–17.
The author describes a method adopted for breeding immune strains which combine high yield and better qualities.
Seedlings are planted in pots containing contaminated soil; these pots are kept for 40 days in a greenhouse the temperature of which is 25° C. Afterwards the plants apparently immune are transplanted in the field where they are bred for several generations until immune strains of high qualities and of uniform genetical constitution are produced.
The author places great importance on the stock used for selection. The most appropriate stock is produced by artificial hybridization between immune and non-immune varieties carefully selected for the purpose. The author concluded that those healthy exceptional plants which exist among non-immune strains when used as stock for selecting and breeding for immunity are often unsuccessful. A. I.

192. GOLDSMITH, G. W. and
MOORE, E. J. 633.51–2.484–1.521.6:575
Field tests of the resistance of cotton to *Phymatotrichum omnivorum*.
Phytopathology 1941 : **31** : 452–63.
Selection for resistance to root rot caused by *P. omnivorum* has been carried out on the following lines: the growth rate of the fungus on decoctions of the roots of single plants was measured and inbred progenies were raised from those plants giving lower growth rates. The initial material was a collection of varieties and a large number of F_2 families.
Field tests showed that this method of selection was effective in reducing the percentage of plants killed as compared with unselected material, that some varieties were more promising than others as sources of resistant material and that the progress due to selection was more rapid in the F_2s than in the varieties.

193. AUDANT, A. 633.51–2.7–1.521.6:575(72.94)
Le charançon du cotonnier en Haïti. **(The weevil of the cotton plant in Haïti).**
Bull. Serv. Nat. Prod. Agric. Enseign. Rur. Haïti 1938 : No. 16 : 64–94.
A series of plot experiments were carried out to determine whether certain indigenous perennial cottons of Haïti were resistant to *Anthonomous grandis* Bohman as had been claimed for them.

Annual cottons were used as controls. Though no definite conclusion is drawn about the point at issue, it appears that the indigenous cotton has the following advantages over the annual type; it is much more resistant to the pink boll worm and mosaic and is more hardy, thriving where more delicate forms would not grow.
It is suggested that the indigenous cottons could be improved by selection for earliness and some promising types for such improvement have already been found.

194. Åkerman, Å. 633.52:575:578.08(48.5)
Anförande vid Linlaboratoriets invigning den 16/12 1940. **(Speech at the inaugural ceremony of the Flax Laboratory on 16/12 1940).**
Sverig. Utsädesfören. Tidskr. 1940 : **50** : 361–64.

Granhall, I.
Sveriges Utsädesförenings linlaboratorium, dess tillkomst och arbetsuppgifter. **(The Flax Laboratory of the Swedish Seed Association—its future and functions).**
Ibid. 1940 : **50** : 365–68.

The first paper contains a review of the trend of Swedish agriculture as regards economic crops during the period following the last war. About 1937 grants were made to promote soya bean, sweet lupin and maize cultivation. The growing of oil and fibre crops—especially flax—also received encouragement and seed production from such crops was organized to ensure a reliable supply being maintained. To reduce costs of flax cultivation and to ensure high quality of the flax the Flax Laboratory for processing flax has been established by the Swedish Seed Association with the assistance of commercial concerns interested in flax breeding and manufacture.
The second article deals briefly with Sweden's achievements in flax breeding and its promising future and with the development of flax and other fibre crops in recent years in Sweden.
The improvement of quality should be greatly facilitated by the new Flax Laboratory which is here described.

195. Gubin, A. F. 633.52:581.162.32
(The effect of pollination of flax by bees).
Jarovizacija 1941 : No. 1 (34) : 102–03.

Flax plants that had been visited by bees produced 28·57% more seed and the thousand grain weight was increased from 5·0372 to 5·1329. Even in this plant therefore self-fertilization evidently reduces yield.

196. Floderus, B. 633.584.3:575.127.2
Some new *Salix* species and hybrids.
Bot. Notiser 1940 : No. 2 : 227–30.

The new species described is *S. bhutanensis*. Descriptions are also given of the hybrids *S. caprea* x *rorida* and *S. helvetica* x *purpurea*.

SUGAR PLANTS 633.6

197. 633.61:575(72.91)
Proceedings of the fourteenth annual conference. Asociacion de técnicos azucareros de Cuba.
1940 : Pp. 362.

In the agriculture section of these proceedings the following papers of possible interest to sugar cane breeders occur—"Some observations on the evolution of cane varieties in Cuba (1796-1940)" by F. Agete, "Comparative study of cane varieties in Puerto Rico and Cuba" by F. Poey, "The mineral composition of the leaves of different sugar cane varieties and its possible relationship with the efficiency of their mineral nutrition" by C. E. Beauchamp and J. E. Alvariño and "Diseases of sugar cane" by S. C. Bruner.

198. 633.63:575(43.91)
Sedlmayr, C. 633.63.00.14(43.91)
A cukorrépafajtakérdés megoldása. **(The solution of the problem of sugar beet varieties).**
Rep. Hung. Agric. Exp. Sta. 1940 : **43** : 23–42.

In view of the importance of local adaptation the author favours the breeding of Hungarian regional varieties and the constant control of all sugar beet varieties in use, based on continuous

field trials. He considers the following criteria should be taken into account: yield of roots per acre, sugar content, yield of sugar per acre, dry matter in the juice, quotient of purity, noxious nitrogen, soluble ash, amount of leaf and tops and yield per acre of these, bolting, *Cercospora*, *Phoma* and *Pythium*, shape of root and stand.
The author makes recommendations for the Hungarian Government in accordance with his views.

199. 633.63:575(47)
[Resolutions of the meeting of breeders, technologists, phytopathologists and biochemists at the Research Institute for the Sugar Industry (VNIS) on 3–5 July, 1940 at Kiev]. "Principles of sugar beet variety production in connexion with securing the initial stages of seed production."
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1940 : No. 1–2 : 141–44.
Various criticisms of the present system of producing new sugar beet varieties include the excessive number of lines taken to the élite stage and beyond, without adequate proof of their merit. Recommendations are given for improving the system.

200. Buzanov, I. F. 633.63:575(47)
(Breeding sugar beet in new beet growing regions).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1940 : No. 1–2 : 3–13.
For the Biisk station, situated in the forest steppe zone with a very short growing season, the object has been to produce types combining high yield of root and sugar and some of the hybrids have shown advances of 5·9 to 11·6% on the standard in this respect in tests carried out in 1938. Similar improvements were noted in 1939. By the method of prolonged vernalization the percentage of bolting has been materially reduced without affecting the yield. Other selections combine earlier sugar production with unimpaired yield. The Biisk region has a somewhat adverse effect on seed germination and vigour of the resulting seedlings as compared with seed raised in certain other areas and it is proposed to remove the work of seed production elsewhere. Selection has resulted in an increase of both drought and frost resistance, the work in the latter direction having also served to reduce the percentage of bolters. Vernalization has produced substantial yield increases in some varieties and marked reductions in others. No advantage has been observed from sowing mixtures of strains.
At the Frunze regional station, situated in the irrigated sugar beet area of the Kirgiz and Kazakh SSR, significant increases in yield and sugar percentage have been obtained by selection and also marked improvements in resistance to silo rot. The varieties differ in the response to vernalization and to different manurial elements.

201. Patlan', P. I.,
Semuškin, P. I.,
Rjabuško, A. D.,
Demčenko, F. K. and
Iščuk, I. Ja. 633.63:575(47)
(Brief conclusions from the work of the experimental field of the Verkhnjačka breeding station for 1938).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : 16 : No. 2–3 : 131–38.
Two sugar beet varieties both of the E type were found to differ in the amount and proportion of the different mineral elements they absorbed; thus per unit of yield variety 1026 absorbed less nitrogen and more potassium and phosphorus than variety 1406. The latter variety was about equal in yield but exceeded 1026 in sugar content by 0·25–1·27%.

202. *Zosimovič, V. P. and 633.63:575(47)
Orlovskii, N. I. 633.63:576.16
(Breeding and seed production of sugar beet).
Naučyne Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 2–3 : 19–32.
A brief outline is given of the organization and development of Soviet sugar beet breeding

* An extended summary of this paper is on file at the Bureau.

and of its present problems. Some of the achievements are then enumerated. These include lines combining high yield and high sugar content, forms reacting to different manurial elements, others reduced in bolting, resistant to root rot and silage rot.
Crosses are being made with chard and with wild species. Among the valuable characters of the latter are winter habit, cold resistance, drought resistance, large root, one-seeded glomerule and a high degree of resistance to *Cercospora*, nematode, etc. The supposed origin of the cultivated beet is traced on the basis of the most recent data. Savitskii's crosses of sugar beet with forage and table beet and chard are possessed of a number of characters not present in the existing sugar beets, such as high root weight, round roots emerging slightly from the soil and earliness but are low in sugar content; by back-crossing with sugar beet their sugar content has been brought to the required level. Some of the hybrids are low in nitrogen content and more resistant to *Cercospora.*

203. Orlovskii, N. I. 633.63:581.143.26:631.521.6:575
(The present position and future problems in breeding high yielding sugar beet varieties free from bolting).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 2–3 : 76–91.

Figures are given showing the increase in the percentage of bolters in the same varieties when grown in more northerly latitudes. It is further shown that the quality of the root is diminished even if the plant is preparing to flower, without actually having formed a stem; the sugar content falls more during storage in bolters. The causes of bolting on the basis of phasic development are analysed; these are associated with the low temperature, high humidity and long day of the northern latitudes, and data are given of greenhouse experiments, which confirm this. The figures also show that varieties differ in the length of their vernalization phases. The varieties Barres and Ramon' 763 have both a long thermo- and photo-stage and are least prone to bolting. There are indications that bolting is also affected by *p*H, mineral elements, spacing, etc. An examination of the conditions at different breeding stations in the U.S.S.R. is made to show which are most favourable to bolting and hence most suitable for breeding non-bolting strains; and in fact it is seen that the strains produced by these stations, namely the L'gov, Ivanovo and Ramon' stations, contain a lower percentage of bolters than those of other stations, those of the Pervomaisk station being the most liable to bolt.
In using artificial methods of provoking bolting it is important to apply the particular factors most likely to be decisive in the region in question; e.g. long day should not be employed in southern zones where it is not likely to occur. Other methods recommended are vernalization in ice chambers, very early sowing (February or even autumn sowing), action of low temperature on the young seedlings, high manuring and wide spacing.

204. Wimmer, G. 633.63:581.45:575
Die Möglichkeit einer besseren Verwertung der Zuckerrüben im Zusammenhange mit der Entwicklung ihrer Blätter. **(The possibility of a better evaluation of sugar beets in connexion with the development of their leaves).**
Zuckerrübenbau 1941 : **23** : 91–98.

Data from sand culture experiments are advanced to show that individual beets and varieties differ in the proportion of their leaves which die before harvest and that in general those with lower percentages dying before harvest have higher sugar percentage. This character could therefore be used in selecting for higher sugar percentage.
There is also variation in respect of the proportion of the total dry weight made up by tops (crown and leaves) and this attribute is positively associated with yield of sugar per beet. Hence if the sugar yield is to be raised as well as the sugar percentage this character too will need to be taken into account.

205. Buzanov, I. F. 633.63:581.48:575.3–18
(The state congress on sugar beet breeding 5th–9th July, 1939).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 2–3 : 35–53.

Much larger yields of seed have been obtained from large roots weighing say 400–500 grm. than from small roots of 180 grm., refuting the view of some "formal" geneticists, who maintain that the size of root makes no difference.

The resolutions of the congress are reported. By correctly planned breeding work it has now been possible to produce sugar beet varieties adapted to all the main regions of cultivation, as a result of which very material increases in sugar yield have been effected. The results of breeding for a variety of special characteristics such as resistance, low bolting, etc., have contributed too.

A number of defects are referred to, such as the tendency to replace existing varieties by new ones before these have been definitely proved to be superior. Insufficient attention is given to the conditions under which plants for seed production are grown and it is recommended that intravarietal crossing should be between material grown under different conditions of manuring, moisture, vernalization, etc. The seeds must be multiplied as far as possible in the regions for which they are designed.

Insufficient attention has been given to the reduction of bolting on the basis of phasic analysis. Methods of stimulating bolting for purposes of selection should be of such a type as are likely to occur in nature and not such as to break up the hereditary constitution of the race as far as other characters are concerned; the methods recommended are: early sowing on highly fertile ground; vernalization for a period compatible with the conditions of the neighbourhood; wide spacing. Tests should also be made with the method of germinating at low temperatures used by the L'gov station.

The microbiological method of testing resistance to *Botrytis* has enabled a number of lines resistant to silo rot to be isolated; and resistance has been shown to be independent of yield and reaction to *Cercospora*. Insufficient attention is given to silo rot resistance at most breeding stations and recommendations are made to the effect that the subject should receive more attention, especially when breeding for reduced noxious nitrogen, where there is a risk of discarding the most resistant plants.

The combination of high yield and sugar content can be improved by supplying suitable pollinators. In this respect it is recommended that attention be paid to the production of forms with the minimum loss of sugar during storage; also to hybridization with other forms of beet.

Stress is again laid upon the desirability of making selections under intensive conditions of cultivation so as to select types responsive to such conditions; it is further recommended that new varieties should be tested under a variety of manurial conditions, so that it may be specified which elements they are responsive to.

STARCH PLANTS 633.68*

206. GRANER, E. A. 633.682:576.356.5:581.04

Polyploid cassava induced by colchicine treatment.

J. Hered. 1941 : **32** : 281–88.

Cuttings of *Manihot utilissima* Pohl were raised in pots and after 30 days all shoots but the strongest were removed. The apical bud of this shoot was kept for 8 days in contact with cotton soaked in 0·5 or 1·0% colchicine. By this treatment several plants were produced with larger stomata and broader and thicker leaf lobes than the controls. These plants were found to be polyploids, one of them being octoploid ($2n = 144$) and the rest tetraploid ($2n=72$). In the plants raised by cuttings from these polyploids it will be possible to study the effects of polyploidy on such economically important characters as root size and starch content (cf. also "Plant Breeding Abstracts", Vol. X, Abst. 1076).

STIMULANTS 633.7†

207. BRIEGER, F. G. 633.71:575.127.2:576.16

Mutações e poliploidia como base da evolução. (**Mutations and polyploidy as a basis for evolution**).

An. Primeira Reunião Sul-Amer. Bot. 1938 : **1** : 259–73.

The author refers to a number of botanical varieties and even species that differ in one or at the most two simple genes and give Mendelian ratios when crossed. The origin of species by hybridization and chromosome duplication is illustrated from the genus *Nicotiana*. In his hybrids of *N. Tabacum* with *N. silvestris* and *N. tomentosiformis* he rarely found $12_{II} + 12_{I}$ as

*See also Abst. 74 (Taro). † See also Absts 60-1 (Tobacco).

reported by other authors but more usually about 22 units, ascribed either to translocations between the two genoms or to partial homology between them.
Illustrations are given of the back-cross (*Tabacum* Cuba x *tomentosiformis*) x *Tabacum* Cuba. Many of the segregates are transgressive and some represent types different from either of the parental species and can be fixed by a few generations of selfing; on back-crossing with *N. Tabacum* these types gave intermediate progeny and all had $2n = 48$ with regular meiosis.
The cross *N. Tabacum* x *N. tomentosa* gave results essentially similar. Illustrations are given of certain hybrids of *N. Tabacum* x *N. silvestris* and of hybrids with doubled chromosome number ($2n = 60$) from *N. petiolaris* x *N. tomentosiformis*. The polyploid hybrids differ from the unduplicated almost only in their fertility. A number of hybrids from the triple cross *N. Tabacum* x *tomentosiforms* x *silvestris* are illustrated, some of them again being types different from those found in any of the three parental species.
None of the *N. silvestris* characters in the above crosses gave simple segregation. Certain characters of the other species gave simple ratios and are thought to be the results of relatively recent mutation.

208. Greenleaf, W. H. 633.71:576.356.4:581.331.1
The probable explanation of low transmission ratios of certain monosomic types of *Nicotiana Tabacum*.
Proc. Nat. Acad. Sci. Wash. 1941 : **27** : 427–30.

Embryo-sac development and seed fertility were studied in flowers of the haplo-*P* monosomic ($2n$–1) *N. Tabacum*. The transmission ratio for haplo-*P* through embryo-sacs is only about 4%. This is not due to univalent elimination since about 80% of the megaspores have n–1 chromosomes nor is it due to selection in favour of megaspores with the full haploid complement by a method similar to the Renner effect in *Oenothera*. It does appear, however, to be due to the slow rate of development of those megaspores which have n–1 chromosomes. As a result of this slow development those embryo-sacs which lack a *P* chromosome are not ready for fertilization when the pollen tubes arrive in the ovary.

209. 633.71:576.356.5:575
Clausen, R. E. 633.71:581.6
Symposium on "Theoretical and practical aspects of polyploidy in crop plants". Polyploidy in *Nicotiana* (with discussion by H. H. Smith).
Amer. Nat. 1941 : **75** : 291–309.

It is suggested from a survey of autopolyploidy effects in *Nicotiana* that there seems to be little hope of any direct commercial utilization of the condition in this genus. The fertility of artificially produced amphidiploids is then considered. Such amphidiploids in *Nicotiana* have a peculiar type of female sterility (see "Plant Breeding Abstracts", Vol. XI, Abst. 1053). It is pointed out that in plant breeding operations amphidiploids may be employed either directly or may also be used to transfer factors from one species to another. The constitutions of *N. Tabacum* and its amphidiploid counterparts are discussed in the last two sections of the paper. The results of genetical experiments suggest that many chromosome segments present in duplicate in the original amphidiploid have been lost in the evolution of *N. Tabacum*. In the aggregate this simplification of the genetic constitution must have involved very extensive alterations.
In the discussion by H. H. Smith, work being done by the Division of Tobacco Investigations, Bureau of Plant Industry, U.S. Department of Agriculture on *Nicotiana* polyploids is described. Polyploids from crosses between *N. Debneyi* x *N. Tabacum* are being studied (*N. Debneyi* is resistant to blue mould). Secondly polyploidy is being used as a means of producing a strain that will yield large amounts of anabasine, an alkaloid with insecticidal properties. This alkaloid is present in small amounts in *N. glauca* and *N. Debneyi*. In the third place induced polyploids are being used to obtain extra chromosomal types in *N. Langsdorffii* and *N. Sanderae*.

210. Jakovuk, A. S. 633.71:581.162:575.41
(Selective fertilization in tobacco plants).
Proc. Lenin. Acad. Agric. Sci. U.S.S.R. 1941 : No. **4** : 3–7.

Flowers of the variety Tyk-Kulak No. 92 were pollinated with self pollen and pollen from three other varieties, Dubec, Trebezond and Samsun. Very few of the progeny resembled Tyk-Kulak, showing that selective fertilization had taken place in favour of the foreign pollen.

There were appreciably less Trebezond types than those resembling the other two types, forms resembling Samsun being the most frequent.
To test the effect of different quantities of pollen from the different varieties flowers of Samsun No. 57 were pollinated with mixtures of pollen of American No. 572, Trebezond No. 1269, Tisskii and the maternal variety in varying proportions. The progeny contained an excess of plants of the American 572 type even when the pollen of other varieties exceeded this variety in the pollen mixture by up to 5 times. Similarly, in the progeny of American 573, pollinated with the pollen mixture, the Tisskii type predominated, even when the pollen of other varieties was in excess; moreover selfs were more frequent than types resembling Samsun 57 and Trebezond 1269; these 2 varieties are thus incompatible with American 573 when used as pollen parents, though when Samsun 57 was used as seed parent it selected the American 573 pollen. Further experiments showed that Samsun, used as seed parent, selects not Trebezond but American, though Trebezond, used as seed parent, selects Samsun.
The variety Trebezond when pollinated with a mixture of its own pollen and that of the variety Maryland selected its own, even when Maryland was present in excess. This is explained by the very different biological character of the two varieties, which have been selected in very different environments.
No connexion was distinguishable between these results and the energy of germination of the pollen grains of the different varieties in artificial media.

211. Simura, T. 633.72–2.421.9–1.521.6:581.192
(Further studies on the resistance to brown blight in tea plants).
Jap. J. Genet. 1940 : **16** : 246–56.
It was found in general that leaves of tea varieties resistant to brown blight (*Guignardia Camelliae* [Cooke] Butler) contained more tannin and less nitrogen than those of susceptible varieties and it is suggested that the relative tannin and nitrogen contents are very important in determining the development of the pathogen in the leaf tissues. Culture of the blight fungus on artificial media to which tannins and nitrogen compounds were added confirmed the above hypothesis. It is suggested that the selection of young tea plants for resistance to brown blight could be made from a knowledge of the tannin and nitrogen contents of their leaves.

212. Carvalho, A. 633.73:575(67.8)
Trabalhos de seleção de *Coffea arabica* realizados em Tanganyika. **(Work on breeding *C. arabica* in Tanganyika).**
Rev. Inst. Café S. Paulo 1941 : **16** : 868–72.
Reference is made to the work of S. M. Gilbert (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 943).

213. Ferwerda, F. P. 633.73:581.165.1:581.162.32
Resultaten van eenige mengproeven met koffiecloonen op Bangelan. **(Results of some trials of mixed plantings with coffee clones at Bangelan).**
Bergcultures 1941 : **15** : 557–66.
Numbers of coffee clones (and some seedlings) selected for this research on the effects on yield of monoclone and mixed plantations were laid out at Bangelan in 1932 and 1933 where pollination problems had originally been investigated and data on the cross-fertility of various clones assembled. The technique of the experiments and the proper evaluation of the results are fully described.
Robusta and related forms were included in the experimental material because of their marked self-incompatibility. Two other experimental groups were composed of Liberica-Arabica hybrids and Conuga clones respectively.
The experiments with Robusta showed an average increase of 50% in the yield from mixed plantings as compared with monoclone blocks. Reasons are suggested why this difference was not even greater in view of the results of the previous hybridization experiments (cf. "Plant Breeding Abstracts", Vol IV, Abst. 215). Having regard to the high yield obtained from Robusta Bgn. 372 in mixed plantings in the present experiment, clones such as Bgn. 300, 325, 340, 371 and some of the élites from Soember Asin and B.P. selections might well give yields as high as 1,500 kg. of market coffee per ha.

The influence of the proportion of the component clones in a mixed planting upon yields is discussed.
Similar improvements in yield were obtained from mixed planting with Conuga clones and also with a group of clones comprising the Liberia-Arabica hybrids Kawisari, Sr. Sengkareng and Q.P. forms. An increase of 36% in production was obtained in the Conuga experiment, a 5-year average for the mixed plantings of 1,250 kg. of market coffee per ha. being recorded. The 5 clone mixture proved the best. The mixture Con. Bgn. 4 and 161 gave 37% and 35% more respectively when grown together than when grown separately.
With the Kawisari hybrids and the Sr. Sengkareng hybrids there was practically no effect from mixing the clones—a result which must be considered in the light of the possibility that in these experiments the plots were too small to bring out the ill effects of monoclone planting.
The Q.P. hybrids showed a definite improvement in the production from mixtures.
The influence of mixed planting on the percentage of empty seeds and spongey beans is to be studied in the future.

214. 633.73–1.557:575:581.165.1(92)
634·973:575·12

VEEN, R. van der
Koffieproducties. (**Coffee production**).
Bergcultures 1941 : **15** : 278–85.

This paper deals very fully with the various cultural, biological, and other factors that determine yield in coffee and incidentally touches upon the relative importance of selection in ensuring optimum yields.
Lammer's recent work on *Leucaena pulverulenta* and *L. glauca* x *L. glabrata*, which is likely to lead to the production of more rapidly growing types that are also improved as regards pruning, is also mentioned (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 479).

215. 633.73–1.557:581.165.1(92.2)

SNOEP, W.
Productiegegevens van koffie-cloonen in het ressort van het Proefstation Midden- en Oost-Java. (**Yield data of coffee clones in the district of the Central and East Java Experiment Station**).
Bergcultures 1941 : **15** : 399–409.

Further results (up to 1940), of the various series of experiments first reviewed in "Plant Breeding Abstracts", Vol. IX, Abst. 1575, are set out with, in addition, results from two trial plantations in Central Java, from some younger experimental plantations in which grafting of various Robusta is being investigated and from plantings of Conuga.
The interpretation of tabulated data and the basis of selection in recommending clones for general use are considered.
Among the recommended clones were SA 13 and BP 42, the highest yielders for which a relatively large amount of data is available, and they are placed in the "universally good" class. Other clones that have done well are SA 34, SA 56, BP 39, Moemb. III–04 and Bgn. 300.
Considerable differences in bean size were recorded for the recommended clones, but no definite conclusions on this difficult subject could be reached. Incidentally, flat beans are stated to weigh practically the same as or only very slightly less than round ones.
Though on high dry land the Conuga clones cannot equal the best Robusta types in yield, yet from high lying humid lands Conuga forms may give good results even when compared with the best Robusta clones to which they may be preferred owing to their disease resistance, recuperative powers after heavy bearing, etc., etc. The best Conuga clones were: Con. Bgn. 2–03, 4, 6, 161 and Con. SA 36. Differences in bean size appear to be much less between these clones than in the Robusta clones. Information from planters suggests that Con. BGn. 4 has the largest beans, and that Bgn. 2–03, 2–08, 2–17 and 161 come next in this respect.
The value of various clones as grafting material has also been examined.

216. 633.74:575.42(92)
633.73:575.42(92)

COOLHAAS, C.
Proeftuin Kedoengpani van het Proefstation Midden- en Oost-Java. (**Experimental plantation Kedoengpani of the Central and East-Java Experiment Station**).
Bergcultures 1941 : **15** : p. 376.

The new experimental plantation of the Central and East-Java Experiment Station, which is to be a centre for selection work on cacao and Excelsa coffee, is already in use for the

production of buddings of cacao and Excelsa and for accommodating a small planting of the legitimate family Djatiroenggo 1 × 2.

217. Tollenaar, D. 633.74:581.165.1:575(92.2)
De beteekenis van het onderstamvraagstuk voor de cacao-cultuur. (**The importance of the stock problem for cacao cultivation**).
Bergcultures 1941 : **15** : 553–56.

Progress in the improvement of cacao in Java is called for, the development and systematic breeding of this crop for various reasons having been hitherto neglected as regards the quality of the planting material used, in spite of the fact that the considerable variation in the types of the Angoleta-Djatiroenggo and Forastero-hybrids being grown evidently offers excellent prospects for the selection of vigorous, disease resistant and high yielding forms superior to the old populations. On the other hand, the Djatiroenggo Estate has plantations of mother clones that have been tested for about 25 years; and Wellensiek and Ostendorf have conducted valuable research on cotyledon colour and fertility in Java cacao (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 396, Vol. VIII, Abst. 207, Vol. III, Abst. 260, Vol. II, Abst. 485, etc.); in addition a certain amount of selection work has been accomplished on some estates including Ngobo. The establishment of the Kedoengpani Central Cacao Experimental Plantation in Central Java should also promote cacao research.

On the Ngobo Estate in 1931–33 about 50 ha. were laid down with Angoleta-mother trees (from the Assiman Estate), with families from Forastero-mother trees (from the Getas Estate), and from the tested Djatiroenggo-clones, and in recent years with families from various mother trees of different origins. Buddings from various trees were also included.

The Angoleta families all turned out so badly that they were eliminated but a lot of Angoleta buddings which had been taken from the same mother trees and grafted on Forastero stocks did very well and show that Forastero families have advantages as stocks for Angoleta lacking in Angoleta seedlings.

The Forastero types have in practice always shown themselves more vigorous than the Angoleta hybrids and Djatiroenggo hybrids, and thus in spite of their defect—purple cotyledon colour—ultimately show promise as stocks for tested Djatiroenggo clones.

Some of the Forastero families also surpassed the Angoleta daughter trees and the progeny of certain Forastero mother trees seemed to be superior in vigour to the progeny of other Forastero trees. Very considerable differences too were found in the growth capacity of 15 different illegitimate Forastero families used as stocks for buddings. In budding these 15 families could be grouped according to their growth as 7 of the best, 4 medium growers and 4 poor growers and the corresponding growth classes for buddings on these 3 groups of trees were 1·7, 1·25 and 0·25 (0 indicating the lowest and 2 the highest grading)—a clear correlation between the growth of the stock families and of the buddings on them.

Some quite hopeful results have been obtained by grafting Djatiroenggo clones with white cotyledons upon vigorous Forastero families.

CONDIMENTS 633.84*

218. 633.842:576.356.5:581.04
Nishiyama, I. 635.646:576.356.5:581.04
(Studies on artificial polyploid plants, I. Production of tetraploids by treatment with colchicine).
Agric. Hort. 1939 : **14** : 1411–22.

By colchicine treatment the author obtained tetraploid plants of *Capsicum annuum*, *Solanum Melongena* and *S. Melongena* x *S. Tamogo*. The tetraploid *Capsicum* ($n = 24$) formed a few quadrivalents at meiosis and only 75% of cells at second metaphase showed the regular numerical disjunction of 24 : 24. Similar meiotic divisions were observed in the tetraploid *Solanum* plants. The tetraploids had larger stomata and pollen grains than the corresponding diploids and showed the usual gigas characters. They also had reduced fertility.

OIL PLANTS 633.85

219. Andersson, G. 633.85:575(48.5)
Odling av oljeväxter. (**Growing oil plants**).
Lantmannen 1941 : **25** : 175–77.

In 1938 research on oil plants and their improvement by breeding was begun at Svalöf by the

* See also Absts 68 and 103 (Pepper).

Swedish Seed Association (Sveriges Utsädesforening) and the production of better varieties suitable for cultivation under Swedish conditions has been successfully accomplished. Rape, turnip rape, poppy, white mustard, flax and (to some extent) soya bean are the crops that are being studied.
The variety of rape grown in Sweden is a late rape bred at Svalöf before the war and is of Swedish origin. It is high yielding and should prove the best variety for conditions in Sweden.
Sunflower and safflower are also being bred but no varieties suitable for Sweden are ready yet for cultivation.

220. Nicolaisen, W. 633.853.49:575
Probleme des Anbaues und der Züchtung von Raps und Rübsen. (**Problems of the cultivation and breeding of cole seed and colza**).
Forschungsdienst 1941 : **11** : 286–99.

The main objective of breeding work should be winter hardiness, especially for eastern localities, though losses due to winter injury occasionally happen in the west. A basis for improvement in this respect already exists in varietal collections and progenies.
A more general mechanization of the cole seed harvest would be facilitated by non-shattering pods. Lembke of Malchow has strains with so much resistance to shattering that they may even be difficult to thresh. Becker, of Dippe Brothers, Quedlinburg, has also made progress in this direction.
Earliness of maturity is an advantage in most districts, because of avoidance of injury by insect pests and the afforded interval between the cole seed and the winter barley harvests.
Other desirable characters mentioned briefly are capacity for regeneration as a defence against rape beetle (*Meligethes*), suitability for late sowing (in cole seed) and high oil content. The status of spring cole seed as a crop might be improved by breeding.

221. Taran, E, N. 633.854.56:575.127.2:581.6
(**Oil extracted from the first fruits of the hybrid *Aleurites Fordii* x *Aleurites cordata***).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1941 : No. 7 : 34–36.

Although *A. Fordii* is superior in yield and quality of oil its earlier flowering and maturity make it more difficult to grow in the Soviet Subtropics. Some of the interspecific hybrids made in 1933–34 bore fruit for the first time in 1939. Their seeds contained 8·67% water, 2·95% salt and 54·68% oil, the oil content by dry weight amounting to 59·87%; this is lower than the majority of plants of *A. Fordii*, which contain over 60%.
Finely ground seeds were triturated with petroleum ether and the oil isolated; the oil resembled ordinary tung oil in odour and consistency and in composition fulfilled the requirements of the American standard (A.S.T.M.St.). Its iodine number was 164·64, that of *A. Fordii* varying in different individuals from 157·86 to 169·87 and that of *A. cordata* from 145·59 to 147·89 in the female trees and 153·18 to 155·18 in the monoecious. The time required for gelatinization of the oil at 282° was 15·5 minutes, as against 9 minutes for *A. Fordii* and 48 minutes for *A. cordata*. The product of gelatinization was somewhat less dense than that from *A. Fordii*.

222. 633.854.78:575.14
Morozov, V. K. 633.854.78:575.12:575.148
(**Breeding sunflower by the method of inbreeding**).
Socialistic Grain Farming, Saratov 1940 : No. 2 : 29–50.

The various defects observed as a result of inbreeding are enumerated and it is pointed out that none of the forms that segregate out are superior to the original population. Tables of yield data are given to illustrate the loss of yield in all inbred populations. Lines that had been selfed for a number of consecutive generations when exposed to open pollination gave increases of yield of 2–100 fold or even more.
The behaviour of a number of the so-called inbred lines over a number of years is examined and the conclusion is reached that they have been accidentally cross-pollinated since this rise in yield in the later generations has been accompanied by a loss of uniformity. In any case the yield of these lines was invariably inferior to that of the best mass-selected varieties.
Attempts were made to cross the inbred lines in all possible combinations, select the best combination and from this produce a line capable of being maintained by selfing, being freed

from undesirable genes. No success has been obtained in this either, the yield having suffered just as much as before by self-pollination. Even mixtures of inbred lines allowed to interpollinate under spatial isolation for a number of years showed a falling off in yield and oil content.

On the other hand, yield increases of up to 52·4% were obtained by introducing material of the variety No. 169 from widely separated areas of the country and allowing them to interpollinate.

223. ANAN'EVA, S. V. 633.854.78:575.257
(Vegetative hybridization of sunflower).
Socialistic Grain Farming, Saratov 1940 : No. 4 : 168–70.

Grafts of *Helianthus occidentalis* (perennial) on annual sunflower varieties altered the leaf and seed type of the stock and increased its vegetation period. When annual varieties of different vegetation period were grafted, an effect was observed on the scion; alterations in the oil content of the scion were also observed. Abnormalities were observed also in the progeny of the grafted plants.

TANNING PLANTS 633.87

224. WIND, R. 633.87:576.16(92)
De looistoffenindustrie in Nederlandsch-Indië. (**The tanning substances industry in the Netherlands East Indies**).
Bergcultures **1941** : **15** : 569–74; also Econ. Weekblad **10** : No. 16.

The production and merits of the following species of shrubs used as a source of tanning substances are discussed: Mangrove varieties (bakau and tengar) gambir (*Uncaria Gambir* Roxb.), pilang (*Acacia leucophloea* Willd), wattle (*Acacia decurrens* var. *mollis*), segawé (*Adenanthera microsperma* T. en B.), trenggoeli (*Cassia Fistula* L.), weroe (*Albizzia procera* Bth.) and kesambi (*Schleichera Oleosa* Merr.).

Trials of *A. decurrens*, *A. pycnantha*, and *A. saligna* had shown that the three varieties of *A. decurrens*, namely, *normalis*, *pauciglandulosa* and *mollis* could be recommended for cultivation, but later investigations led to the conclusion that only the varieties *mollis*, and possibly in some localities, *normalis*, were satisfactory for cultivation as sources of tannin.

MEDICINAL PLANTS 633.88

225. WIT, F. 633.88:581.162.5:581.162.3(92.2)
De biologie van de vruchtvorming bij *Strophantus gratus*. (**The biology of fruitsetting of *S. gratus***).
Landbouw 1941 : **17** : 98–105.

The merits of *S. gratus* as compared with other species of the same genus which also have medicinal properties are enumerated.

In view of the possibilities of morphological or other peculiarities in the reproduction process of *S. gratus*, a study of the biology of flowering of this plant was undertaken in connexion with cultural experiments on the crop in the Netherlands East Indies and the fruit and seed are here described. Experiments with three plants showed that (1) the under rim of the stigma is the receptive zone and cross-pollination in which the pollen is transferred to this area would seem to be essential for fruit setting; (2) all three plants were highly sterile.

Apparently too, suitable pollinating agents (e.g. insects or birds) are not available in Java, as is also occasionally the case with *S. hispidus* when cultivation is attempted in certain regions of tropical Africa.

Artificial pollination would therefore be necessary if a good set is to be obtained.

226. GREGORY, W. C. 633.881.6:576.312.35
Cytology and phylogeny in the Ranunculaceae.
Proc. Va Acad. Sci. 1939–40 : **1** : 215–16.

Among the many chromosome numbers given are those of $n = 8$ and $2n = 16$ for *Aconitum reclinatum* Gray and *A. uncinatum* L.

227. MARAÑON, J. and BARTLETT, H. H. 633.885.1–2.411.4–1.521.6:575(91.4)
Cinchona cultivation and the production of totaquina in the Philippines.
Nat. Appl. Sci. Bull. Univ. Philipp. 1941 : **8** : 111–87.

The introduction of *Cinchona* into the Philippines is described. Bark canker, caused by

Stigeosporium Cinchonae, is a very serious disease and a programme of breeding and selection has been started to obtain high yielding and resistant types. The resistant *C. Ledgeriana* trees obtained have low alkaloid contents but four resistant trees locally called "*C. hybrida*" all have bark with over 7% alkaloid. There are also many other "*C. hybrida*" plants in the experimental plantation. These trees, which may be hybrids between *C. succirubra* and *C. Ledgeriana*, are very variable and are of great value for breeding. The plantation in which they are grown affords a very rigorous selection for canker resistance.

RUBBER PLANTS 633.91

228. COSTER, C. 633.912:581.165.1:578.088(92)
Het keuren op cloonechtheid van heveazaden. (**Examination of rubber seeds for clonal authenticity**).
Bergcultures 1941 : **15** : p. 192.

The facilities offered (for a small fee) by the West Java Experiment Station are set out for the benefit of planters who may wish to have *Hevea* seed from clones on their estates identified by comparison with the standard hybrid and other clones maintained by the Station. Only small samples of seed (25 seeds at most) are required and these can be returned undamaged after the examination. The scope of the information that can be supplied from an examination of this nature is mentioned.

229. LAMMERS, R. P. 633.912:581.481:578.08
Eenige verdere gegevens over het splitsen van Hevea-kiemplanten. (**Some further data on the splitting of Hevea seedlings**).
Bergcultures 1941 : **15** : 397–98.

In one set of experiments the rearing of twin rubber plants by Ramaer's method was investigated following a complaint from an estate that among seedlings obtained by this technique damage from the effects of sun was liable to occur. Seed of PR 7 (illegimate) was used in the experiment which was begun in 1939. At first the unsplit seedlings were ahead of the twin plants but in 1941 the following circumference measurements were recorded: unsplit seedlings 9·9 cm., 100%, twin plants (Ramaer) 7·2 cm., 74%. The twin seedlings were therefore about 25% less developed than the other group.

A second series of experiments was made to compare the Gambar and Ramaer techniques of splitting seedlings (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 447) and to examine the possibilities of obtaining triplets by an elaboration of the Gambar method.

After practice no losses occurred in producing twin plants, but with the triplets the losses amounted to about 20% of the seedlings. Special difficulty was experienced in keeping the triplet from the central portion alive, as is seen from the following figures shown as percentages of the material planted:—Twins (Ramaer) 20%; Twins (Gambar)—main shoot 4%, lateral shoot 30% (17%); Triplets—main shoot 46%, lateral 15% (25%); control 0%.

Plant measurements suggest that in spite of incidental losses the Gambar method would appear preferable to the Ramaer method.

Triplets cannot be regarded as a practical proposition, though the technique is feasible for scientific purposes. The likelihood of the three plants of any triplet group surviving together would, however, probably be somewhat remote.

FRUITS 634*

230. PELLETT, K. 634:575(77.7)
Pioneers in Iowa horticulture.
Trans. Iowa St. Hort. Soc. 1940 : **75** : 5–71.

Included among the pioneers whose biographies are sketched are the following who were concerned with the varietal improvement of fruits for the severe climate of Iowa: J. L. Budd, introducer of many Russian apples and teacher of N. E. Hansen; G. B. Brackett, expert on apple varieties; C. G. Pattern, apple breeder; J. Hiatt, the discoverer of the apply Delicious; H. A. Terry, breeder of native plums.

231. HANSEN, N. E. 634:575(78.3)
Northern plant novelties for 1941.
38th Rep. S. Dak. St. Hort. Soc. 1941 : 30–34.

Details are given of hardy fruit varieties bred by Hansen. These include the Hansen bush

* See also Abst. 69; Abst. 70 (Stone fruits); Abst. 74 (Papaya).

cherry (*Prunus Besseyi*); the following varieties of apples—Nebo, Semla, Lina and Wakpala; the crab apples—Keo, S. D. Eda, S. D. Bona, S. D. Bison and S. D. Jonsib; and the hardy pears for the Northern Great Plains—Finland, Finsib, Krylov, Sadko, Selenga, Tanya, Sladky, Yermak and Okolo. The parents of these varieties are given in the descriptions.

232. Filatov, F. 634:575.127
(Let us profit by the legacy of I. V. Michurin in work on crop plants).
Socialistic Grain Farming, Saratov 1940 : No. 3 : 6–12.
An outline is given of Michurin's principles.

233. Grigor'ev, I. Ja. 634:575.127(47)
(A follower of Michurin).
Sady i Ogorody (Fruit and Vegetable Gardens) 1941 : No. 4 : 4–5.
Reference is made to the work of Michurin's pupil P. N. Jakovlev, who has effected a great many more wide crosses among fruit trees for the production of hardy forms for northern zones.

234. Stankovič, D. M. 634:576.354.4:576.312.35
(Cytological analysis of certain varieties of vines, cherries, apples and pears).
Arhiv Minist. Poljopr. 1938 : **5** : No. 13 : 83–91.
The work of previous investigators is reviewed and the cytological methods employed are described in detail.
The author enumerates the following varieties of vines as material used for his investigation: Marchal Foch, Oberlin 604, Seibel 1000, Seibel 4896, Seibel 5979, Seibel 5409, Seibel 5455 (direct producers) and Chasselas jaune ciré, Chasselas rose des Bouches du Rhône, Chasselas précoce de Tours, Louisette, Madeleine Angevine, Oberlin, Pinot Salomon, Foire de Lyon. All had the same haploid chromosome number, namely $n = 19$. Reduction division was regular, 19 bivalents being observed, with an entire absence of uni- or multi-valents. Tetrad formation was also perfectly regular. Little variation was observed in the size of pollen mother cells, which varied from $22{\cdot}95 \pm 0{\cdot}32$ to $28{\cdot}05 \pm 0{\cdot}41$; of the tetrads, which varied from $22{\cdot}15 \pm 0{\cdot}26$ to $27{\cdot}83 \pm 0{\cdot}33$; or of the pollen grains, which varied from $12{\cdot}75 \pm 0{\cdot}48$ to $17{\cdot}85 \pm 0{\cdot}21\mu$.
All the varieties of cherries investigated were diploid ($2n = 16$). No aberrant chromosome numbers were found. The following are given as the names of the varieties analysed: Big. de Germerdorf, Big. Jabouley, Big. Morreau, Big. Reverchon, Baloise, Cerise Pailly, Cerise Rossier, Masson 4/11, Noir de Boccard, Précoce de Clies, Sunner Duillier. The chromosomes at somatic metaphases are rod shaped and equal in thickness, but not in length. Few irregularities of division were observed, except in Bigarreau de Germerdorf, apparently resulting from temperature changes. The varieties are thus seen to be highly suitable for breeding by hybridization.
The varieties of pome fruits investigated are stated to have included the apples Astrakhan rouge, Bramley's Seedling, Early Rivers, Melba, Pioneer, San Jacinto; and the pears, Beurré de Heimburg, Duchesse d'Angoulême and Bergamotte Esperen.
All these apples and pears proved diploid ($2n = 34$) and no chromosome irregularities were observed. They are all therefore suitable for hybridization within their respective species either *inter se* or with other diploid forms.

235. McCrory, S. A. 634–2.111–1.521.6
Winter injury and hardiness of fruit trees.
38th Rep. S. Dak. St. Hort. Soc. 1941 : 56–60.
The reasons why plants are subject to injuries from low temperatures during the winter season are considered under three headings—injuries associated with immature and not properly hardened tissues; inability of tissues to resist winter drought; and injury to tissues which respond readily to short periods of warm weather.

236. Lantz, H. L. 634.11:575(77.7)
New seedling fruits productions of 1940.
Trans. Iowa St. Hort. Soc. 1940 : **75** : 124–28.
Over 3,000 seedling apple trees bore fruit at Ames, Iowa in 1940, and the fruit showed the expected wide variation, including in some cases total resistance to scab.
Notes are given on the performance of several varieties as breeding parents. In general

sib-crosses produce poor trees and inferior fruits, better results being given by half-sib-crosses and out-crosses.

In 1940, 40 seedling apples were selected for second test.

Breeding work with peaches, plums, strawberries and raspberries is also in progress.

237. Simonov, I. N. 634.11:575"793":578.088

(Biochemical and biological differences between apple varieties).

Trudy Moskovskoi ordena Lenina Sel'skokhozjaistvennoi Akademii imeni K.A. Timirjazeva 1940 : **4** : Pt 1 : 71–101.

Investigations were made of a number of physiological, biochemical and morphological characters in early, medium and late varieties of apple. Firstly the peroxidase and catalase contents of the leaves on young shoots of as nearly as possible identical age and condition were determined. The earlier ripening varieties displayed the highest catalase activity and the late varieties the lowest, regardless of the time at which the analysis was made—the first was on 7th August and the last on 8th September; determinations made in the following year, though different in value, were the same as regards the relative position of the varieties. The mid-season varieties were intermediate. Peroxidase showed the inverse relationship, being most active in the late ripening varieties. The saccharase activity was also less in early than in late varieties, in consequence of which the winter ripeners have a higher content of reducing sugars in their leaves than summer ripeners, whilst the latter have a higher content of disaccharides.

The same differences were observed between early and late varieties of gooseberry, currant, strawberry and raspberry. The catalase activity was greatest in the leaves on the upper part of the bush. The varietal differences observed are regarded not as the cause of the differences in earliness but as a result of the different physiological constitution of the various types.

The photosynthetic activity, expressed in mg. CO_2 decomposed per hour by 100 cm^2 of leaf, also differed in varieties, being greatest in the early ripening forms and least in the late. The number of stomata per unit area of leaf surface was greatest in the early varieties and least in the late. The early varieties also had a greater quantity of palisade cells and less spongy parenchyma. Observations on the leaf morphology indicate that the first pair of veins at the base of the leaf were less strongly developed in the early varieties, in which the whole of the lateral veins tended to be concentrated in the basal portion of the leaf, which was not so in late ripening forms. Surface irregularities were more frequent on the leaves of late than in early varieties. Leaf formation in the early growth period was more rapid in the early varieties but ceased earlier, in July; abscission and lignification of the shoots were also earlier.

All the above distinctions between early and late types are thought to be of value in making selections among seedlings in the early stages of breeding work.

238. Levošin, V. K. 634.11:575.247

(Form development within a clone in apples).

Socialistic Grain Farming, Saratov 1940 : No. 1 : 142–58.

Examination of the chief apple varieties of the Volga basin showed them all to be very mixed as regards fruit form and colour, habit of growth, leaf development and also in such characters as vigour, yield and hardiness. Some of the most pronounced variants are described. They are interpreted as "profound changes of the hereditary constitution of the variety brought about by the interaction of the environment and the internal hereditary properties of the variety". Some of the variants are of practical interest, such as forms of greater vigour of growth and higher yield, improved flavour or greater disease resistance. Some varieties, such as the pink striped Anis, are more prone to variation than others. All possible gradations exist between the grey Anis on the one hand and the even pink Velvet Anis on the other. In old trees, some of 120–130 years of age, variations were observed with the greatest frequency. They occurred on individual branches or twigs, most of them of the type of Velvet Anis, with fruit of even pink colour, finer texture, whiter flesh and characteristic shape. Many of these old trees had been cut back and the variation occurred at the point where the new branch had grown out from the wound callus; the trees were also frequently badly diseased. One case is quoted where the Velvet Anis sport reverted to the original striped Anis in one of its branches.

It is pointed out that all the bud variants of the variety Anis studied were superior in fruit quality, whereas the variants of the variety Maltese Cross were distinctly inferior to the mother

variety. Mutations of various kinds including many from striped to red fruits are reported in other varieties. The necessity of paying attention to these variations in selecting budwood is emphasized. The results suggest that the Velvet Anis, which is one of the most popular varieties of the district, originated by bud mutation from the striped form and the possibility is suggested of finding still better forms among the new variants now discovered.

239. Dibrova, P. A. 634.11–2.111–1.521.6(47)
(New varieties of apple of the North Urals).
Michurin's Sverdlovsk Fruit Exp. Sta. 1940 : Pp. 14. Also Plodovo-Jagodnye Kultury (Fruit Crops) 1940 : No. 4.

The importance of the local forms is once more stressed. Many forms of apple capable of growing in the Urals have been raised by amateurs by simply sowing the seeds and carefully tending the seedlings in the early stages. A study of these local forms has been made and the best are being propagated; they are described and illustrated in this bulletin, characters of the tree, fruit and flesh being given, together with data on time of ripening, winter-hardiness, resistance to drought, scab and other diseases. The best forms have survived winters where the temperatures have gone down to as low as − 50° C. The high quality of some of these varieties fully justifies the method and they are to be crossed with the best varieties of Western Europe in the attempt to raise their quality still further.

240. Rodionov, A. and 634.11–2.111–1.521.6:631.4
Zelenskii, M. 634.22–2.111–1.521.6:631.4
(Winter-hardiness of apple and plum hybrids in relation to soil conditions).
Jarovizacija 1941 : No. 1 (34) : 108–09.

Apple hybrids were hardier in sandy soil, while most plum hybrids were hardier in clay, though there were certain exceptions in the plums.

241. 634.13–2.111–1.521.6:575.127.2
Jakovlev, P. N. 634.11–2.111–1.521.6:575.127.2
(Michurin varieties in the tests of the 1939–40 winter).
Jarovizacija 1940 : No. 6 (33) : 51–63.

The excessively cold winter of 1939–40 killed off a very large number of fruit trees and even wild-growing forest trees, but many of Michurin's varieties of fruits, even apricots, vines, cherries and almonds, survived.

Some of the hybrids of Bere-Pobeda [Beurré-Victory], a not very hardy pear hybrid, with southern pears from France, have proved exceedingly hardy, having withstood frosts of − 40° C. Similar increases in hardiness have been noted in certain other pear crosses and apple crosses. The hybrids of *Pyrus ussuriensis* Max. and of *P. serotina* Rehd. have also proved very hardy.

242. 634.22(48.5)
Forsberg, N.-G. 634.22:576.356.5
Vilka plommon odlas i vårt land? **(Which plums are grown in our country ?)**
Fruktodlaren 1941 : No. 2 : 53–55.

A brief account is given of the plums belonging to the groups (1) *Prunus domestica* and *P. insititia*; (2) *P. cerasifera* and (3) *P. salicina*—the species grown in Sweden. Some cytological data are also reviewed including the findings of Crane and Lawrence and A. Rybin.

243. 634.23:582
Forsberg, N.-G. 634.24:582
Körsbärens härstamning och indelning. **(The origin and classification of the cherry).**
Fruktodlaren 1941 : No. 3 : 77–78.

A note on the accepted classes of cherries belonging to the species *Prunus avium, P. Cerasus* and the hybrid group attributed to crosses between *P. avium* and *P. Cerasus.*

244. Vikla, J. 634.25:575:581.165.71
Fruit and tree improvement.
38th Rep. S. Dak. St. Hort. Soc. 1941 : 61–62.

The author believes that hardy peach trees could be developed by budding first year seedlings

on the hardiest plum trees or apricots and then by repeated buddings on hardy stock again for three years. The idea of several buddings is to make sure that the grafts would be budded on some stock which has strong influence. After three years the next generation of seedlings is raised from the buddings and these are again repeatedly budded on to hardy stock. It is suggested that every generation would produce hardier seedlings and in 4 or 5 generations sufficient hardiness could be obtained. The author is not young enough to undertake the task and is content to leave it to younger men after giving them his ideas. He obtained his ideas for this type of breeding from experiments with an unusually hardy N.W. Greening seedling apple grafted on a Peerless apple tree and on a Siberian crab and believes that when infant seedlings are budded, the influence of stock on the grafts is permanent.

245. HOFMANN, F. W. 634.25:581.45:575.061.6
Some foliar characters for peach breeding.
Proc. Va Acad. Sci. 1939–40 : **1** : 208–09.

The presence of conspicuous olive yellow green spots on fully grown leaves is due to a single factor but there are different degrees of development of this spotting in different strains of peaches. Associations between the colour of the first etiolated leaves and fruit flesh colour and between hypocotyl and flesh colours have also been observed. Yellow to yellow-ochre leaves are associated with yellow fleshed fruits and pale or light yellow leaves with white or cream fleshed fruits. If the hypocotyl is reddish, the fruit will be blushed and the more red the hypocotyl the heavier the blush.

CITRUS FRUITS 634.3*

246. LAPIN, V. K. and TELOUCH, V. G. 634.3:576.356.5:578.08:581.49
Size and number of stomata in diploid and polyploid forms in *Citrus, Poncirus* and *Fortunella.*
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **27** : 365–68.

Using diploid and polyploid material already isolated by karyological analysis, the following characteristics were studied in leaf section to ascertain which were suitable for rapid identification of polyploids: crystals, crystal-containing cells, chloroplasts, size of stomata and number of stomata per unit area.

Stomatal size and number were found to be suitable attributes for this purpose. The changes in these attributes accompanying changes in degree of polyploidy depended on the character considered (stomatal number being more consistent in its behaviour), on the form (species, hybrid, variety) concerned and on the degree of polyploidy concerned.

NUTS 634.5†

247. LOUNSBERRY, C. C. 634.512:575(77.7)
Black walnuts of Iowa.
Trans. Iowa St. Hort. Soc. 1940 : **75** : 210–12.

The measurements of the nuts of a number of selections are tabulated.

248. HIGGINS, B. B., HOLLEY, K. T., PICKETT, T. A. and WHEELER, C. D. 634.58:575(75.8)
Peanut breeding and characteristics of some new strains.
Bull. Ga Exp. Sta. 1941 : No. 213 : 3–11.

The original object of the breeding programme started in 1931 was to produce a bunch peanut of the Spanish type resistant to diseases and with non-sprouting seed. The Spanish peanut, which is susceptible to leaf-spot diseases and to Southern Blight and is also subject to sprouting of seeds as soon as mature, was crossed with disease-resistant and non-sprouting types. All the crosses showed hybrid vigour but this vigour had usually disappeared by the fourth generation. Individual plant selection had to be continued until the F_6 to F_{10} generations before plant and seed characteristics were sufficiently fixed. In addition to the disease-resistant, non-sprouting, bunch peanut of the Spanish type, the following six types of probable value have also been selected—disease-resistant bunch types with non-sprouting seeds; high-yielding strains similar to Spanish but not disease-resistant; very tall, erect bunch types to be

* See also Abst. 69 (Citrus and Fig). † See also Abst. 69 (Peanut) and Abst. 74 (Macadamia).

cut for hay; very viny bunch types to be harvested for cattle feed; high-yielding runners with low oil percentage in the seed for hogging-off; and early-maturing runners for hogging-off. The yields and characteristics of strains of these types are then given.

SMALL BUSH FRUITS 634.7*

249. Šaškina, L. 634.75:575.127.2:581.165.71
(Strawberry grafts).
Jarovizacija 1940 : No. 6 (33) : 108–09.

Grafts of hybrids of *Fragaria grandiflora* x *F. elatior* on to the parent species succeeded in May, before the plants were capable of forming their own roots.

250. Iliev, P. 634.75.0014(49.7)
(A varietal experiment with strawberries).
Zemledelie, Sofia 1939 : **43** : 122–25.

The following varieties of strawberries have undergone tests (begun in 1937) at the Sadovo Agricultural Experiment Station in Bulgaria: Madam Muto, Sharples, Sv. Iosif [St. Joseph], Lutsidija Perfekta, Fekondita Konstanta and Imperatritsa. Their various characteristics and the layout of the experiments are described. The flowering period was studied in view of the importance of its duration and intensity—both of which were found to vary considerably in the 6 varieties, as did also the time of onset of flowering.

St. Joseph and Imperatritsa gave the highest yields, exceeding the standard Madam Muto by 5–8%. Nevertheless, owing to the acid and insipid flavour of the former and the very small fruits of the second these two varieties are inferior in importance to Madam Muto. Sharples on the other hand gave a relatively low yield.

In both years of the experiment the relative size of the 6 or 7 pickings varied, the main harvests in 1938 being the second, third, fourth, and fifth and in 1939 only the second and third.

Fruit size also showed a visible tendency to vary both between and within the different varieties.

VITICULTURE 634.8†

251. 634.835:577.8
Moisseyev, K. A. 634.835–2.111–1.521.6:575.127.2
(Regarding forms of *Vitis amurensis* Rupr. with hermaphrodite flowers).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1941 : No. 3 : 16–18.

Male plants of *V. amurensis* growing far away from any possibility of out-crossing with cultivated forms bore large numbers of intersexual and hermaphrodite flowers, the proportions varying in different years. This observation supports Negrul's views on the origin of hermaphrodite forms (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1337).

The hermaphrodite forms are the most suitable for crossing with cultivated vines in breeding for frost resistance.

252. Fennell, J. L. 634.835–2–1.521.6:575(73)
Future "ideal" grapes.
J. Hered. 1941 : **32** : 193–97.

The problem of breeding the ideal grape, a good sized, high quality fruit, approaching *vinifera* in character, borne on vigorous, productive and self-fertile vines which are satisfactorily resistant to diseases and insect pests, including *Phylloxera*, is considered. Such a grape will be produced from hybrids between the *vinifera* varieties and the American wild species such as *Vitis cinerea, vulpina, tiliaefolia* and *rufotomentosa*. These species are much more disease and insect resistant than *V. labrusca* which has so often been used in breeding work. It is also important to note that the *vinifera* varieties show a wide variation in disease resistance.

FORESTRY 634.9‡

253. Arzybašev, D. D. 634.97–2.111–1.521.6:575.42
(Work on introducing valuable species into northern zones).
Lesnoe Khozjaistvo (Forestry) 1939 : No. 9 : 16–22.

It has been found possible to acclimatize in Russia tree species native in say Vancouver by

* See also Abst. 69 (Rubus and Strawberries) and Abst. 71 (Raspberries and Strawberries).
† See also Abst. 69. ‡ See also Abst. 69 (Oaks).

introducing through successive stages, e.g. the first generation to Alaska, the second Finland and finally the third to Moscow; some sort of selection process has evidently taken place. Various methods of preventing damage by cold are described and a number of species which have been successfully introduced in the above manner are enumerated.

254. NAVARRO DE ANDRADE, E. 634.973:575.127.2
The eucalyptus in Brazil.
J. Hered. 1941 : **32** : 215–20, 240.

The last section of the article deals very shortly with hybrids in the genus *Eucalyptus*. *E. paulistana* (from the natural cross *E. globulus* x *E. robusta*) is stated to be a very fine tree with all the virtues of the parents but without their defects. Trees of the F_5 generation from this cross have been raised by now and the progenies have not shown any variations since the F_3.

255. DUFFIELD, J. W. and SNOW, A. G. (jun.) 634.975:581.331.2
Pollen longevity of *Pinus strobus* and *Pinus resinosa* as controlled by humidity and temperature.
Amer. J. Bot. 1941 : **28** : 175–77.

DUFFIELD, J. W. and SNOW, A. G. (jun.)
Effect of storage conditions on pollen longevity of *Pinus strobus* and *Pinus resinosa*.
J. For. 1941 : **39** : 410–11.

The percentage germination of pollen of the two *Pinus* species stored at four levels of relative humidity and at four temperatures was determined for storage periods of 44, 93, 181, 370 and 413 days. Storage at a relative humidity of 50% and at 0° or 4° C. for one year gave a germination percentage of about 80%. Percentage germination was reduced to practically zero after storage at relative humidities of 0% and 10% or at room temperature and 30° C. Germinability of pollen stored at low humidities was increased by humidification at 75% relative humidity and 4° C. for 72 hours.

VEGETABLES 635*

256. MORRISON, G. 635:575
Behind the scenes and beneath the surface in vegetable seed breeding.
Market Gr. J. 1941 : **68** : 300–03, 331, 340–42.

A brief, popular account of the principles of plant breeding, with special reference to vegetables.

257. WINTER, F. L. 635:575
Prospect and retrospect in vegetable development.
Seed World 1940 : **47** : No. 6 : 26–27.

The needs which may be met by new varieties of vegetables are resistance to diseases and pests, local adaptation, suitability for new methods of preserving and better dietetic value. The methods of producing new varieties are very briefly outlined.

258. HASTINGS, D. 635:575(73)
Seedsmen visit vegetable laboratory.
Seed World 1941 : **50** : No. 1 : 36–37.

At the U.S. Southeastern Regional Vegetable laboratory breeding work is in progress with beans (*Phaseolus*), peas, cabbage, tomato, sweet corn, cucumber, melon, watermelon and lettuce, special attention being paid to resistance to disease, pests and adverse climatic factors.

259. WORK, P. 635:575(74.7)
Vegetable variety field days held in New York.
Seed World 1940 : **48** : No. 7 : 14–15.

At Cornell University, Ithaca, New York, visitors saw tomato trials, including new varieties, of which Victor (All-Red x Break-o'-Day) and Firesteel (Bison x Pritchard) are mentioned;

* See also Abst. 63 (Soya bean); Abst. 67 (Beans and Popcorn); Absts 68 and 69; Abst. 70 (Tomatoes and beans); Abst. 74; Abst. 78 (Peas); Absts 82–4 (Tomato); Abst. 91 (Broad bean); Abst. 96 (Phaseolus and Onion); Abst. 144 (Sweet corn).

musk-melon breeding with the object of a high quality, readily marketable variety resistant to *Fusarium*; breeding a mosaic resistant cucumber from crosses of the resistant variety Shamrock with commercial varieties; breeding self-blanching, good quality celeries and also studies on yield trial technique with vegetables.
At Geneva, New York, breeding work on tomatoes, squash and *Fusarium*-resistant cabbage was inspected.

260. 635:575(74.8)
Vegetable and flower variety and breeding field days August 14 and 15, 1941.
Market Gr. J. 1941 : **69** : p. 390.
Work in progress to be shown at State College, Pennsylvania, included progeny and strain tests with Penn State Ballhead cabbage; tomato selections from the cross Oxheart x Penn State Earliana; locally produced rhubarb varieties and progenies raised by open pollination, selfing and crossing; varieties, selections, crosses and inbred lines of sweet corn; pepper selections from commercial varieties and from the cross California Wonderbell x Harris Earliest and a comparison of plants raised by open and controlled pollination from the same parent plants.

261. Work, P. 635:575(75)
Vegetable variety field days. USDA and University of Maryland play hosts to seedsmen and experiment station workers.
Seed World 1941 : **50** : No. 5 : 8–9.
At the U.S. Horticultural Station, Beltsville, Maryland, visitors saw breeding work on beans for disease resistance and hardiness for southern conditions, on onions for resistance to thrips, smut, blotch and pink root, on cucumbers for resistance to bacterial wilt and mosaic, on tomatoes for resistance to *Septoria*, wilt and mosaic, on sweet potatoes, on lima beans for high quality, high yield and larger seed and on lettuces for resistance to aster yellows.
At the University of Maryland breeding work seen included that on muskmelons for disease resistance and regional adaptation.

262. Garcia, J. A. 635–1.531.12:575(79.4)
Plant breeding a very important factor in the growing of garden seed.
Seed World 1940 : **47** : No. 6 : 24–25.
The part played by plant breeding in the vegetable seed industry in California is briefly reviewed.

263. Walker, J. C. 635–2–1.521.6
Disease resistance in vegetable crops.
Bot. Rev. 1941 : **7** : 458–506.
This review is divided into four sections -introduction (mainly historical), the nature of disease resistance (including a sub-section on variability of the pathogen), the relation of environment to disease resistance and resistance in specific vegetable crops (this section is by far the largest part of the article, pages 469–496). The crops are arranged in alphabetical order and the notes on their disease resistance include descriptions of physiological races of the organisms causing the disease and of the genetics of the resistant types. There are 255 references in the bibliography.

264. Sax, K. 635.25:576.356.2:537.531
The behaviour of X-ray induced chromosomal aberrations in Allium root tip cells.
Genetics 1941 : **26** : 418–25.
Onion bulbs and seeds were irradiated with X-rays both before and after germination. Two effects are distinguished, a "primary" effect consisting of clumping and partial fusion of the chromosomes and a temporary inhibition of nuclear activity, and a "secondary" effect consisting of the production of the typical chromosome aberrations, rings, dicentrics, inversions, translocations and deletions, terminal or interstitial.
The ring and dicentric chromosomes, probably because of the deficiencies associated with them,

are eliminated in succeeding cell generations and only cells with a normal or balanced genom survive. Dicentrics and rings can give rise to secondary aberrations by breakage of anaphase bridges and subsequent fusions. The time at which these appear shows that three to four days elapse between successive anaphases in onion root tips.
Dormant bulbs are about ten times as sensitive to X-rays as dry seeds, measured by aberration frequency. The seeds produce about 3% of spontaneous aberrations and this is increased by a physiological effect of X-rays similar to that produced by age or heat. The frequency of spontaneous aberrations in bulbs was negligible and not increased by the physiological effect of X-ray irradiation.

265. 635.31:575(73)
Announce new variety of asparagus.
Seed World 1940 : **47** : No. 2 : p. 32.
The Germain Seed and Plant Co., Los Angeles, California has introduced a new variety of asparagus, Paradise, which, it is claimed, comes into production a year earlier than any other variety. It is similar in appearance to Martha Washington, resistant to rust and has a milder flavour.

266. Yeager, A. F. and Scott, D. H. 635.31:577.8:631.557
Asparagus.
38th Rep. S. Dak. St. Hort. Soc. 1941 : 52–55.
The last section of this short article discusses sex in asparagus. In a 15-year old bed the ratio of males to females was 1·4 : 1 and in a 36-year old bed 2·5 : 1. It was also found that considering the yield of a mixed population to be 100, staminate plants yield 124 and pistillate plants 68. It thus seems that male plants yield better than females.

267. Coulter, F. C. 635.34:576.16
The story of garden vegetables. V. Cabbage: planted the world over for peasant and for king.
Seed World 1941 : **50** : No. 6 : 18–19.
While the Romans had in garden cultivation forms of the kale or collard type, the headed cabbage probably arose in Holland in the 14th century. The island of Amager, near Copenhagen, has been renowned for its cabbages since its settlement by Netherlanders in the 16th century and Danish Ballhead and Copenhagen Market originated there.
Named varieties were sold by the early American seedsmen and an important improvement was the selection of the yellows-resistant Wisconsin Hollander, introduced in 1920, being derived from healthy plants in a field of Ferry's Hollander infected with yellows.

268. Berger, C. A. 635.41:576.356.5
Reinvestigation of polysomaty in *Spinacia*.
Bot. Gaz. 1941 : **102** : 759–69.
Polysomaty in the root tip of *Spinacia* was found to be restricted to the periblem. The polyploid cells arise by successive reproduction of chromosomes during the resting stage of the nuclear cycle (cf. "Plant Breeding Abstracts", Vol. X, Abst. 242). The paired conditions of chromosomes during mitosis indicates that the double chromosome reproduction took place during the resting stage immediately preceding. The degree of polyploidy of cells in the resting stage can be judged by the number and size of nucleoli and the number of heterochromatic satellites associated with the nucleolus.

269. Hylmö, B. 635.41:577.8:577.17
Einwirkung durch Hormonbehandlung auf das Geschlecht der *Spinacia*.
(**Action by hormone treatment upon the sex of *Spinacia***).
Bot. Notiser 1940 : No. 4 : 389–94.
Sex types in *Spinacia*, their number and reactions to treatment with testosteron and oestron are discussed and illustrated. The sex changes in the experimental plants can, it is claimed, be interpreted as in accordance with the theoretical expectation—testosteron increasing the frequency of male types and oestron, the frequency of female types.

270. WHITAKER, T. W. and PRYOR, D. E. 635.52–2.421.1–1.521.6:575.11

The inheritance of resistance to powdery mildew (*Erysiphe cichoracearum* in lettuce.

Phytopathology 1941 : **31** : 534–40.

The progeny of a single plant of the wild lettuce, *Lactuca scariola*, like many other collections bred true for susceptibility to powdery mildew; Imperial 850, like the majority of cultivated varieties (*L. sativa*) breeds true for immunity. In the cross between the two, with Imperial 850 as seed parent, the F_1 was resistant and in F_2 ratios of 3 healthy : 1 susceptible were obtained and again in the F_3. Immunity is therefore governed by a single dominant factor. Differences in susceptibility occur among the susceptible plants and these may be due to further genes.

271. DAVIS, G. W. 635.61:575(79.4)

A new melon, Baby Persian, makes bow. California produces a uniform-sized fruit for commercial growers; also a potential for southern gardens.

Sth. Seedsman 1941 : **4** : No. 2 : 7, 31.

Baby Persian, a new melon variety developed co-operatively by the California Agricultural Experiment Station and the U.S. Department of Agriculture has uniform small fruits weighing about 6 or 7 pounds, almost round, smooth and thickfleshed, with a small seed cavity. It is resistant to form 1 but susceptible to form 2 of powdery mildew. Its origin is not given.

272. BROWN, H. D. 635.611:575

Miscellaneous field tests 1940. Fertilizers for vegetables.

Proc. 26th Ann. Mtg. Ohio Veg. Potato Grow. Ass. 1941 : 5–15.

Short notes are given on breeding uniform coloured tomatoes and a new muskmelon hybrid. The hybrid from Perfecto x Milwankee was of very good quality and 70% of its fruits had a small cavity.

273. 635.611–2.411.4–1.521.6:575

Breeding mildew resistant cantaloupe.

Seed World 1940 : **48** : No. 13 : p. 17.

At the Winter Haven Substation of the Texas Agricultural Experiment Station a variety of cantaloupe resistant to downy mildew, but not suitable for transporting, has been considerably improved by inbreeding and selection.

274. 635.611–2.484–1.521.6:575(77.6)

New muskmelon wilt-resistant.

Seed World 1941 : **49** : No. 4 : p. 24.

This brief note mentions the new muskmelon Golden Gopher, released by the Division of Horticulture, University Farm, St. Paul, Minnesota. It is resistant to *Fusarium* wilt.

275. 635.615–2.484–1.521.6:575.12

New hybrid watermelon developed in Iowa.

Seed World 1941 : **49** : No. 1 : p. 15.

A hybrid watermelon has been produced at Iowa State College, Ames by the same method as is used for the production of hybrid maize, seed being produced by crossing several inbred lines. The hybrid inherits high wilt-resistance from two parents and excellent quality from another. Its fruit is oblong to round, striped, with a solid, deep pink heart. The seeds are brown to black. In field tests it has been 75 to 80% wilt-resistant and has yielded an average of 33 pounds. Further field tests by growers will be made in 1941.

276. 635.621:575(74.7)

Introduces new squash.

Seed World 1940 : **47** : No. 1 : p. 7.

Geneva Delicata is a selection from the Delicata squash (*Cucurbita Pepo*) made at the New York State Experiment Station, Geneva. It is claimed to be equal to Table Queen in quality, vigorous, resistant to mosaic and tolerant of borer injury. It matures about the same time as Table Queen, has a moderate vining habit and produces an average of 7 or 8 fruits per plant. The fruits average 8 to 9 inches long and 3½ to 4 inches in diameter, cylindrical, pale cream in colour, marked with narrow, bright green lace-like stripes along the grooves, turning to bright orange during storage. The flesh is orange-yellow and from five-eighths to seven-eighths of an inch thick.

277. Curtis, L. C. 635.621:575.125:575
Development of the All-America squash winner.
Seed World 1940 : **48** : No. 9 : p. 13.
The substance of this article has already been reviewed (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 827).

278. Ito, S. and
Kunii, Y. 635.63:575(52)
(A successful strain of cucumber obtained from crossing experiments).
Plant Breed. News 1934 : 1775–865.
Osaka Experiment Station has been for some years endeavouring to produce a cucumber suitable for the local requirements and the F_1 from the cross Taisen-Fushinari No. 2 x Taisen-Keuma No. 1 are already regarded with some favour by both growers and consumers. In addition, an even better strain, consisting of 34 plants practically fixed in their characters and meeting all the requirements, including vigorous and rapid growth, has been found in the F_3.

279. 635.63–1.524(58)
Hartmair, V. 635.63:581.19:575
Über asiatische Formen von *Cucumis sativus* L. **(On Asiatic forms of *C. sativus* L.).**
Züchter 1941 : **13** : 135–44.
A large part of the cucumbers collected by the German Hindu-Kush Expedition are distinguished by freedom from bitter principle and are being used in breeding work at Weihenstephan with the object of incorporating this character in commercial varieties. Morphological descriptions are here given of a number of these forms, which have been grown and studied for three years.

280. Anderson, W. S. 635.63–2–1.521.6:575
Growing cucumbers for pickling in Mississippi.
Bull. Miss. Agric. Exp. Sta. 1941 : No. 355 : Pp. 17.
It is mentioned that at the Mississippi State College an effort is being made to breed disease resistant cucumbers of the pickling types which will be better suited to Mississippi conditions. Crosses have been made between the National Association Pickling variety and lines which are either vigorous or are resistant to either downy mildew or bacterial wilt. Lines which are resistant to nematode attack have also been found.

281. 635.64:575.257
(The history of a vegetative hybrid).
Jarovizacija 1940 : No. 6 (33) : 102–03.
Experiments of Ju. Ja. Kerkis are referred to in which the variations in the tomato Humbert resulting from grafting were no greater than those in the ungrafted Humbert. It is shown that the line of Humbert used by Kerkis was itself the progeny of a graft hybrid.

282. 635.64:576.356.5:575.42
Lindstrom, E. W. 635.64:576.356.52
Genetic stability of haploid, diploid, and tetraploid genotypes in the tomato.
Genetics 1941 : **26** : 387–97.
A haploid tomato has been maintained by cuttings for 14 years and has proved very stable. No diploid sectors or large chlorophyll mutant sectors arose and only one possible somatic mutation, to the "wiry" condition, was observed. The haploid appears to have developed a form of natural immunity to virus infection and now has a masked type of infection of the aucuba strain.
The homozygous diploid produced from the haploid by the decapitation callus method is highly fertile and very uniform. Mass selection for small plant size has been carried on for nine generations but appears to have been relatively ineffective. Only one major mutation has occurred, a "wiry" mutation (w_2) different from the original "wiry" (w_1).
The autotetraploid derived from the homozygous diploid by the decapitation callus method was highly sterile and attempts to increase fertility by selection were unavailing during eight generations.

283. PORTE, W. S. and
WALKER, H. B. 635.64–2.484–1.521.6:575.127.2:575
The Pan America tomato, a new red variety highly resistant to fusarium wilt.
Circ. U.S. Dep. Agric. 1941 : No. 611 : Pp. 6.

The Pan America tomato was developed from a cross between Marglobe and a wild Peruvian Red Currant selection (*Lycopersicon pimpinellifolium*) which possessed a very high resistance to tomato wilt caused by *Fusarium bulbigenum* var. *lycopersici* (Brushi) Wr. and R. The wild parent had the introduction number of P.I. 79532. The new variety was bred by sucessively back-crossing the hybrid progeny three times to Marglobe inbred lines. Each back-cross generation and the five subsequent generations of line selections have been tested either in the field or in the greenhouse for resistance to virulent strains of the tomato wilt fungus. In all tests 95 to 100% of the sample plants have been entirely free from any evidence of fusarium wilt. The Pan America tomato has the general vine, foliage and fruit type of Marglobe. It is a few days to a week earlier than Marglobe.

284. AVER'JANOVA, O. P. 635.646:575.12:575.148
(Intra-varietal crossing in the egg-plant).
Jarovizacija 1941 : No. 1 (34) : 106–08.

Increases in yield from 28·2 to 156·8% were obtained from different varieties as a result of intravarietal crossing, the fruits being both more numerous and larger. The plants withered less rapidly and remained alive longer at the end of the season.

285. TURUMARU, T. 635.646:581.162.5:581.466
(On the cause of self-sterility of heterostylic flower of the egg-plant).
Bot. & Zool. 1937 : **5** : 1148–50.

In the author's nomenclature a "homostylic" flower is one in which the style is as high or higher than the anthers, and a "heterostylic" flower one in which the style is inferior to the anthers.

Examination of 30 plants each of 8 varieties of egg-plant showed the number of "heterostylic" flowers in all the varieties to be less than that of "homostylic" ones. Fertility was much higher in "homostylic" flowers than in "heterostylic", and attained 86·89% in the variety Motonaga-nasu as compared with 1·02% in the variety Yama-nasu.

In investigation of the cause of sterility 60 young heterostylic flowers were emasculated and pollinated with pollen from homostylic flowers. Only 8 flowers set fruit. Discussing this high sterility, the author attributes it to some form of incomplete development of the pistils.

286. FOMIN, P. 635.65:575.257
(Vegetative hybridization in legumes).
Socialistic Grain Farming, Saratov 1940 : No. 4 : 170–71.

Grafts of lentil on pea gave progeny differing in vegetative and seed characters. Grafts were also made of lentil on broad bean and other combinations.

287. MORRISON, G. 635.652:575(73)
The story of beans. Some of the effort that goes into new varieties – descriptive list.
Nat. Seedsman 1941 : **8** : 20–21, 45.

The high standards of quality for beans (*Phaseolus*) in the U.S.A. are briefly outlined. The varieties which emerged in the early 19th century were mostly local favourites first cultivated by the natives and later by the colonists. In the later 19th century, selection of natural hybrids was responsible for most of the new varieties, whereas to-day controlled hybridization is the method by which new varieties arise.

The outstanding varieties of different types are briefly described.

288. BABB, M. F.,
KRAUS, J. E.,
WADE, B. L. and 635.652–2.112–1.521.6
ZAUMEYER, W. J. 635.652–2.3–1.521.6
Drought tolerance in snap beans.
J. Agric. Res. 1941 : **62** : 543–53.

In tests during a four-year period, U.S. No. 1 Refugee, U.S. No. 5 Refugee and several related strains of snap beans yielded more than the commercial varieties tested under drought or

semi-drought conditions. U.S. No. 5 Refugee also showed least damage when attacked by bacterial blight. Stringless Green Refugee and Fall Measure resembled U.S. No. 5 Refugee in damage by bacterial blight under dry conditions.

289. HARTER, L. L. and ZAUMEYER, W. J. 635.652–2.452–1.521.6:576.16
Differentiation of physiologic races of *Uromyces phaseoli typica* on bean.
J. Agric. Res. 1941 : **62** : 717–31.

Twenty physiological races of bean rust (*U. phaseoli typica*) were differentiated on the basis of their reaction on seven varieties of *Phaseolus vulgaris*. The races were identified from bean material received or collected from localities in the United States and the Hawaiian Islands. The susceptibility and resistance of a large number of commercial bean varieties to races 1 to 14 were also tested. For each race of rust there are a few varieties which are either immune or highly resistant. The parents are thus available for breeding a bean variety resistant to all 14 races of rust.

290. ANDERSON, M. E. 635.652–2.8–1.521.6:575
Sensation Refugees, two new mosaic-resistant varieties.
Canner 1941 : **92** (7) : 14–15.

Two new mosaic-resistant varieties of beans of the Stringless Refugee Green Pod type are being introduced by the Rogers Brothers Seed Company, Chicago, under the names Rogers Sensation 1066 and Rogers Sensation 1071.

Sensation 1066, from the cross Idaho Refugee x Stringless Refugee Green Pod is a very early type, immune from mosaic, free of heritable leaf variegation, tolerant of bacterial common blight and fairly tolerant of halo blight. Sensation 1071, from the cross Idaho Refugee x U.S. No. 1 Refugee is also immune from mozaic, slightly later than Sensation 1066, free of heritable leaf variegation, tolerant of common blight and also of halo blight. Both varieties have long straight, round, medium green pods of the Refugee type.

291. MURPHY, D. M. 635.652–2.8–1.521.6:575(79.6)
Bean improvement and bean diseases in Idaho.
Bull. Idaho Agric. Exp. Sta. 1940 : No. 238 : Pp. 22.

The breeding work at the University of Idaho, whereby strains of Great Northern and Red Mexican beans resistant to the virus diseases, common mosaic and curly top have been produced is reviewed (cf. also "Plant Breeding Abstracts", Vol. V, Abst. 533, Vol. VIII, Abst. 1364 and Vol. X, Abst. 1161).

292. 635.653:581.6:575
Breeders succeed in producing new lima bean varieties for freezing.
Canner 1940 : **90** (25) : p. 12.

The varieties mentioned are Baby Fordhook (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 889), Baby Potato and Early Baby Potato (cf. "Plant Breeding Abstracts", Vol. X, Abst. 912) and Maryland Thick Seeded, bred at the Maryland Agricultural Experiment Station from a single plant found in a field of Hendersen Bush. All the varieties have small plants, small pods and small beans which are thicker than those of Hendersen. In a freezing and cooking test they all performed better than Hendersen.

293. 635.655:575.12(73)
"Hybrid" soybean varieties.
Seed World 1941 : **49** : No. 6 : p. 32.

After pointing out the difference between so-called hybrid soya beans and hybrid maize, the former being selfed selections from hybrid progeny, M. G. Weiss of Iowa State College, Ames, mentions that an extensive breeding programme involving hybridization was started at Iowa Agricultural Experiment Station in 1937. The Illinois Agricultural Experiment Station has released a soya bean variety called Chief, a selection from the progeny of a cross made 8 or 10 years previously.

294. MOGILEVA, A. 635.656:575.12:575.148
(Intravarietal crossing in peas).
Jarovizacija 1941 : No. 1 (34) : p. 104.

A mixture of pollen was placed on emasculated flowers of the same variety and the resulting

seeds gave rise to plants distinguished by greater vigour and a tendency to branching. Considerable variation was observed in respect of time of maturity and yield. Some of the forms bred true for type of branching and yield; one bore 2 basal branches and 13 lateral branches and produced as many as 119 pods.

295. Gromik, I. U. and
Stegailo, T. A. 635.656:581.162:575.41
(The investigation of natural hybridization and selective fertilization in peas).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 2–3 : 101–03.

A green seeded variety was pollinated in the bud with a yellow seeded variety and gave 70–92% of hybrid seeds; on the other hand when the pollination was carried out after the flowers had opened only 1–3% of hybrid seeds were produced. Even under natural conditions however a certain amount of cross-pollination occurs and for seed production purposes it is not advisable to grow two pea varieties contiguously. On the other hand the above results show that by pollinating in the bud it is possible to perform intravarietal crossing without emasculation.

Emasculated flowers of a green seeded variety were pollinated with a mixture of self pollen and pollen from a yellow seeded variety. No preference was shown for the pollen of the other variety, and in fact there were twice as many pods containing exclusively green seeds as pods containing exclusively yellow (hybrid) seeds; in the pods containing both, the green and yellow seeds were in almost equal proportions.

296. 635.656:582:575.12
Gromik, I. U. 635.656:575(47)
(New botanical varieties of pea).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1940 : No. 1–2 : 139–40.

Botanical descriptions are given of certain new varieties belonging to Proles *mediterraneum* Gov. and Proles *europaeum* Gov. which have appeared among the hybrid material and are of possible interest for breeding.

297. Mogilev, L. M. and
Riachovsky, N. A. 635.656–2.482–1.521.6:575.42
(Pure lines of pea variety "Victoria Heine" resistant to *Ascochyta pisi* Lib.).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1941 : No. 3 : 11–12.

Further tests were made on artificially infected ground with the strains previously selected as resistant (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 1145). The data presented show that lines selected in 1938 as resistant were again resistant in 1940. Lines 53 and 405 were particularly resistant in both vegetative organs and pods. The resistant lines do not differ from the Viktoria Heine type in other characters.

298. Harrington, C. D. 635.656–2.7–1.521.6:575
Influence of aphid resistance in peas upon aphid development, reproduction, and longevity.
J. Agric. Res. 1941 : **62** : 461–66.

The rate of development, of reproduction and the longevity of pea aphids [*Macrosiphum* (*Illinoia*) *pisi*] were compared on the varieties Pride and Perfection, representing the extremes of resistance and susceptibility respectively. On the resistant variety the rate of development was slowed by 3·1%, of reproduction by 12·5% and longevity was reduced by 20%. It is concluded that rate of reproduction is likely to be the most useful factor on which to base tests of resistance for use in breeding work.

299. 635.67:575.12
Morrison, G. 633.15:575.12
The fundamentals of seed breeding.
Nat. Seedsman 1940 : February : Pp. 3.

In this review of the development of hybrid sweet corn, Shull's early work on inbreeding and hybridization, leading to his advocating as early as 1909 the method of producing hybrids

now in common use, is described. Hybrid sweet corn is now widely grown in the U.S.A. and by 1938 about 70% of it was Golden Cross Bantam. This hybrid was developed by Glenn M. Smith, its parent lines being two Golden Bantam inbreds, Purdue Bantam and Purdue 51.

300. Smith, L. M. 635.677:575(77.8)
Mrs. Peppard hybridizes popcorn.
Seed World **1941** : **49** : No. **2** : p. 9.

On a farm near Kansas City Mrs J. L. Peppard is applying hybridization to the improvement of popcorn.

301. Kappert, H. 635.9:575:575.1:578.08
Die Vererbungswissenschaft in der gärtnerischen Pflanzenzüchtung unter besonderer Berücksichtigung der Blumenzüchtung. (**Genetics in the breeding of horticultural plants with special reference to the breeding of flowers**).
Forschungsdienst 1940 : **10** : 533–45.

This useful article sets out clearly and fully the advantages to the breeder of a knowledge of genetics and the laws of segregation in obtaining constant desired types in as short a period as possible. The methods to be adopted are illustrated by detailed descriptions of the procedures that have been successfully applied in breeding special types of Petunias, Stocks and Primulas, as well as *Cladosporium* immune tomatoes and high yielding, cold resistant wheats. The technique necessary in making use of polyploid forms while avoiding the difficulties they offer to the breeder is exemplified in the genetical work that has been done on Cyclamen.

COLIN, E. C. 575.1

Elements of genetics. Mendel's laws of heredity with special application to man.

Blakiston Co., Philadelphia 1941 : $3.00. Pp. xii + 386. 47 figs.

The topics covered in this new textbook of genetics are Mendel's work and its rediscovery, dominance and segregation, independent assortment, chromosomes and mendelism, linkage, gene interaction, heredity in man, sex determination and differentiation, sex linkage, heredity and environment, mutation, inbreeding and cross-breeding, evolution and finally eugenics. The style is fluent, the illustrations adequate and there do not appear to be any serious inaccuracies. Considerable attention is paid to man and very little to plant breeding. Exercises are provided at the end of each chapter and there is a glossary and an index but no bibliography apart from references in the text. The production is attractive and the binding is washable.

MASSINGHAM, H. J. (Editor) 63(42)

England and the farmer.

B. T. Batsford, Ltd., London 1941 : 10s. 6d. Pp. vi + 154. 81 pls.

There are eighty-one photographs, one coloured reproduction of a painting, an introduction by H. J. Massingham and seven essays by seven different authors on a variety of subjects in this book. Most of the photographs are excellent and, as this is a Batsford book, they are, of course, well reproduced. There does not, however, seem to be any direct relation between the illustrations and the text. The seven chapters and their authors are—"The policy of husbandry" by Viscount Lymington, "Soil fertility" by Sir Albert Howard, "Corn" by C. Henry Warren, "The family farm" by Adrian Bell, "Rural reconstruction" by Rolf Gardiner, "Diet and farming" by Dr. L. J. Picton and "The reclamation of grasslands" by Prof. Sir George Stapledon. On the whole the general theme of the book would appear to be that English farming, and Englishmen also, would be in a much better state of health, both physical and spiritual, if farming in this country was still carried on as it apparently used to be in the good old days by small, family farmers who used no artificial manures and only a minimum of machinery but who did keep a sufficiency of stock and who did give the land plenty of farm-yard manure.

631:016

Bibliography of soil science, fertilizers and general agronomy 1937–1940.

Imp. Bur. Soil Science, Harpenden 1941 : 25s. Pp. xxiii + 504.

The Imperial Bureau of Soil Science has compiled this bibliography by rearranging the references in Volumes I to III of *Soils and Fertilizers*. It therefore serves also as a cumulative index to those volumes.

The main part of the book is taken up by the bibliography, which is divided into two parts—main and geographical. At the beginning is an index to the classification numbers, being in effect extracts from the Universal Decimal System. The complement to this, the subject index appears at the end of the book and an author index is also provided. A list of abbreviations of the names of journals is given.

Previous issues of this bibliography covered the periods 1931–34 and 1934–37 respectively. The work is now so well known as to need no further recommendation.

MILSUM, J. N. and
GRIST, D. H. 635(91)

Vegetable gardening in Malaya.

Dep. Agric. S.S. and F.M.S., Kuala Lumpur 1941 : Pp. xviii + 206. 52 pls. 8 tables. (Malayan Planting Manual No. 3).

This book deals with all aspects of vegetable gardening in Malaya. The first seven chapters describe climatic and soil conditions, manuring, cultivation, the home garden, Chinese market-gardening and highland vegetable production. In chapters eight to thirteen the many different vegetables are considered crop by crop. The chapter headings are the beans and peas, tuberous and root vegetables, gourds and pumpkins, salad and fruit vegetables, leaf and stem vegetables and flavouring and seasoning herbs. In the consideration of each vegetable

the authors include a description of the plant and notes on propagation, cultivation and uses. This part of the book includes very good photographs of many vegetables. The next two chapters deal with organized vegetable production and the food values of vegetables. Then there is a chapter on garden pests and another on diseases of vegetables. Finally, the last chapter gives some statistics on Malayan production and consumption of vegetables. There is a large general index and three small indexes to Malay, Chinese and Tamil names of vegetables. The production is of a very high standard and no doubt this book will be as useful and popular as two previous books on vegetable culture in Malaya issued by the Department of Agriculture and both now out of print.

INDEX

Aamodt, O. S., 167
Åkerman, Å., 117, 194
Anan'eva, S. V., 223
Anderson, E., 151
Anderson, E. G., 152
Anderson, J. A., 20
Anderson, M. E., 290
Anderson, W. S., 280
Andersson, G., 219
Andrade E. Navarro de, see Navarro de Andrade, E.
Andrés, J. M., 146, 148
Anonymous, 8, 9, 12–4, 28, 32, 39, 50–1, 60–1, 68, 71, 73, 120, 134, 145, 162–3, 185, 197, 199, 260, 265, 273–6, 281, 292–3, p. 85
Armstrong, J. M., 26
Arzybašev, D. D., 253
Atwood, S. S., 172
Audant, A., 193
Avakjan, A. A., 82
Aver'janova, O. P., 284
Ayyangar, G. N. Rangaswami, see Rangaswami Ayyangar, G. N.

B., 62
B. . . . . ., A. F., 36
Babb, M. F., 288
Babu, C. N., 49
Bartlett, H. H., 16, 227
Bascialli, P. C., 146, 148
Bauch, R., 105
Beaumont, J. H., 74
Bereznjakovskaja, A. V., 186
Berger, C. A., 268
Billes, D. J., 43
Björkman, T. V. E., 63
Bodine, E. W., 103
Bogyó, T., 88
Bond, T. E. T., 41, 43
Borkovskaja, V. A., 83
Boyes, J. W., 4
Bradshaw, I. R., 143
Brandl, M., 113
Brieger, F. G., 207
Briggs, F. N., 55
Brojakovskii, N. V., 126
Brown, H. B., 190
Brown, H. D., 272
Broyakovsky, see Brojakovskii
Bukasov, S. M., 180
Buller, A. H. R., 102
Burkholder, W. H., 101
Burkland, E. R., 110
Burnham, C. R., 153
Buzanov, I. F., 200, 205

Câmara, A., 91–3
Carvalho, A., 212
Carver, W. A., 147
Caspersson, T., 89
Cheesman, E. E., 41
Chin, T. C., 19
Clark, C. F., 184
Clark, D. G., 156
Clausen, R. E., 209
Cochran, W. G., 1
Coffman, F. A., 132
Colin, E. C., p. 85
Conner, A. B., 69
Coolhaas, C., 216
Cornish, E. A., 3
Coster, C., 228
Coulter, F. C., 267
Crane, M. B., 47
Curteis, W. M., 15
Curtis, L. C., 277
Curtis, O. F., 156

Davidson, W. A., 54
Davis, G. W., 271
Demčenko, F. K., 201
Dem'janovič, N. I., 125
Derevitskii, see Derevitzky
Derevitzky, N. F., 116
Dibrova, P. A., 239
Dodds, H. H., 33
Dolgušin, D. A., 118
Duffield, J. W., 255
Durrell, L. W., 103

Eastman, M. G., 67
Eigsti, O. J., 86
Ellison, W., 133
Erickson, R. O., 151
Evans, H., 38
Eyster, W. H., 100

Fahmi, T., 127, 191
Fennell, J. L., 252
Ferwerda, F. P., 213
Filatov, F., 232
Fischer, G. W., 106
Fisher, R. A., 11
Floderus, B., 196
Fomin, P., 286
Forsberg, N.-G., 242–3
Fröier, K., 81, 117

Gadkari, P. D., 30–1
Ganguli, R. M., 24
García, J. A., 262
Gibson, D. R., 26
Giles, W. F., 52
Giodano, H. J., 129
Gluščenko, I. E., 137, 176
Goldsmith, G. W., 192
Goss, R. W., 183
Graner, E. A., 206
Granhall, I., 194
Greener, B. M., 109
Greenleaf, W. H., 208
Gregory, W. C., 226
Grigor'ev, I. Ja., 233
Griner, see Greener
Grist, D. H., p. 85
Gromik, I. U., 295–6
Grossman, Ju. Ju., 56
Gubin, A. F., 195
Gulick, A., 90
Gustafsson, Å., 81

Haga, T., 94
Hansen, N. E., 231
Harland, S. C., 187
Harrington, C. D., 298
Harter, L. L., 289
Hartmair, V., 279
Hartwig, E. E., 173
Hastings, D., 258
Hatcher, E. S. J., 53
Hecht, H., 156
Henrici, A. T., 104
Higgins, B. B., 248
Hofmann, F. W., 245
Holley, K. T., 248
Holmberg, C., 182
Holton, C. S., 106
Horner, W. H., 27
Hull, F. H., 147
Hurt, B. H., 65
Huskins, C. L., 112
Hylmö, B., 269

Iliev, P., 250
Iščuk, I. Ja., 201
Ito, S., 278

Jakovlev, P. N., 241
Jakovuk, A. S., 210
Jastreb, N. G., 82
Jensen, J. H., 183
Jones, D. F., 155
Jugenheimer, R. W., 144

Kappert, H., 301
Kartamyšev, V., 160
Kempton, J. H., 150
Kerle, W. D., 18
Khačaturov, S. P., 78
Khan, M. S., 6
Khazina, E. P., 84
Khod'kov, L. E., 157
Kifer, R. S., 65
Kiričenko, F. G., 142
Klein, E., 130
Kosambi, D. D., 2
Krasovskii, I. R., 189
Kraus, J. E., 288
Kreutzer, W. A., 103
Krishnaswami, N., 22
Kugler, W. F., 77
Kunii, Y., 278

Lammers, R. P., 229
Lantz, H. L., 236
Lapin, V. K., 246
Levošin, V. K., 238
Li, C. C., 101
Lindstrom, E. W., 282
Ling, L., 140
Lounsberry, C. C., 247
Luna, J. T., 154
Lysenko, T. D., 85

McCrory, S. A., 235
McIntosh, A. E. S., 35
MacLean, C. A., 5
MacVicar, R. M., 21
Marañon, J., 227
Marino, A. E., 154
Marušev, A. I., 114
Massingham, H. J., (Editor) p. 85
Matsumura, S., 131
Maxwell, L. R., 150
Meredith, W. O. S., 20
Meyer, K., 57
Michel, K., 98
Milsum, J. N., p. 85
Mogileva, A., 294
Mogilev, L. M., 297
Moiseev, see Moisseyev
Moisseyev, K. A., 251
Mokrov, S. V., 138
Moore, E. J., 192
Morozov, V. K., 222

Morrison, G., 256, 287, 299
Müller, K. O., 181
Müntzing, A., 159
Murphy, D. M., 291
Musiiko, A. S., 142

Nakayama, K., 164
Nandi, H. K., 24
Narasimharao, M. P., 45
Navarro de Andrade, E., 254
Neal, D. C., 190
Nebel, B. R., 75
Nicolaisen, W., 220
Nilsson, F., 170
Nishiyama, I., 218
Noguchi, Y., 99
Nordenskiöld, H., 169

Okura, E., 166
Oláh, L., 87
Oliveira, B. de, 108
Olsson, P. A., 174
Orlovskii, N. I., 202–3
Orth, H., 181
Östergren, G., 171

Pal, B. P., 23
Parnell, H. R., 21
Patlan', P. I., 201
Pellett, K., 230
Pickett, T. A., 248
Pirschle, K., 97
Piza, S. de Toledo (jun.), 80
Porte, W. S., 283
Pozdnjakov, M. M., 122
Pridham, J. T., 15
Proičov, G., 149
Propach, H., 175
Pryor, D. E., 270
Putt, E. D., 46

Ramanujam, S., 23
Ramaswami, K., 25
Ramaswami, S. T., 45
Ramiah, K., 25, 29–31
Randolph, L. F., 76
Rangaswami Ayyangar, G. N., 22
Ratera, E. L., 177, 179
Reed, G. M., 135
Riachovsky, N. A., 297
Rjabuško, A. D., 201
Rjakhovskii, see Riachovsky
Rjazanov, Ja., 59
Rodionov, A., 240
Rodrigo, E., 7
Rogers, J. S., 143

Sakai, K., 165
Sallans, H. R., 20
Salmon, E. S., 44
Šaškina, L., 249
Sax, K., 264
Schelotto, B., 72
Schneidermann, Ja. J., 121
Schultz, E. S., 184
Scott, D. H., 266
Sedlmayr, C., 198
Semuškin, P. I., 201
Sengbusch, R. v., 79, 95
Shafer, J. I. (jun.), 156
Sim, J. T. R., 17
Simonov, I. N., 237
Simura, T., 211
Smagin, G. D., 139
Smith, L. M., 300
Smith, W., 120
Šnaiderman, see Schneidermann
Snoep, W., 215
Snow, A. G. (jun.), 255
Sousa, M. C. F. de, 108
Stankovič, D. M., 234
Starkov, A. A., 115
Stegailo, T. A., 295
Stelzner, G., 178
Stevenson, F. J., 184
Stevenson, G. C., 34
Stroman, G. N., 188
Swamirao, R., 45

Takai, Y., 161
Taran, E. N., 221
Tavčar, A., 141
Telouch, V. G., 246
Telschow, E., 58
Tervet, I. W., 107, 136
Thornbrough, A. A., 65
Titov, P. I., 123–4
Toledo, Piza S. de, see Piza, S. de Toledo
Tollenaar, D., 217
Traub, H. P., 96
Turumaru, T., 285
Tydeman, H. M., 48
Tyler, J., 111

Vears, C. K., 15
Veen, R. van der, 214
Venkatraman, T. S., 37
Vikla, J., 244
Viljoen, P. R., 10

Wade, B. L., 288
Walker, H. B., 283
Walker, J. C., 263
Walker, R. H., 70
Wallace, H. A., 66
Warner, J. D., 147
Watson, I. A., 128
Wenholz, H., 15
Wexelsen, H., 168
Wheeler, C. D., 248
Whitaker, T. W., 270
White, W. J., 27
Wimmer, G., 204
Wind, R., 224
Winter, F. L., 257
Wit, F., 225
Woodward, R. W., 158
Work, P., 259, 261

X., 64

Yeager, A. F., 266

Zaumeyer, W. J., 288–9
Žebrak, A. R., 119
Zelenskii, M., 240
Zosimovič, V. P., 202
Zossimovich, see Zosimovič

THE IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,
School of Agriculture, Cambridge, England.

Director : PROF. F. L. ENGLEDOW, M.A., Drapers' Professor of Agriculture.
Deputy Director : P. S. HUDSON, Ph.D.
Assistants :
MISS M. L. C. WILSON, B.A. J. L. FYFE, M.Sc. (Temporary) H. W. HOWARD, Ph.D. (Temporary)
Secretary : MISS V. K. WATSON (Acting).

Publications:

PLANT BREEDING ABSTRACTS.

Issued quarterly. Subscription 25/-, with Subject Index. (Subscriptions sent direct from within the British Commonwealth of Nations are subject to a reduction of 5/-). Single copies 7/6 each. Drafts should be made out in sterling currency.

A few back numbers are obtainable at 35/- per volume, single numbers 10/- each.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 5/- per volume.

Important Note.—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Deputy Director copies of their papers immediately on publication.

Other Publications :

SUPPLEMENTS TO PLANT BREEDING ABSTRACTS	s.	d.
Summary of Reports received from Countries exclusive of the British Empire, 1928-31. Supplement I.	2	6
Summary of Reports received from Stations in the British Empire, 1932-35. Supplement II.	2	6

TECHNICAL COMMUNICATIONS	s.	d.
Vernalization and Phasic Development of Plants	10	0
An Outline of Cytological Technique for Plant Breeders	1	6
The South American Potatoes and their Breeding Value	3	6
The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe	1	0
Field Trials: their Lay-out and Statistical Analysis by John Wishart	2	6
Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland	4	0
Potato Collecting Expeditions in Mexico and South America, by J. G. Hawkes ..	3	0
New and Promising Varieties recently described in the Literature	1	0

INDEXES	s.	d.
Subject Index to Vols I to V of Plant Breeding Abstracts	2	6
Subject Index to Vols VI to VIII of Plant Breeding Abstracts	2	6
Subject Index to Vol IX of Plant Breeding Abstracts	2	6
Subject Index to Vol X of Plant Breeding Abstracts	2	6

BIBLIOGRAPHICAL MONOGRAPHS	s.	d.
Breeding Varieties Resistant to Disease..	2	0
Breeding Resistant Varieties, 1930-33 (Supplement)	2	0
Oat Breeding Bibliography	1	6
Rice Breeding Bibliography	1	6
Bibliography on Interspecific and Intergeneric Hybridization in Relation to Plant Breeding	2	0
Account of Research in Progress in the British Empire	3	6
Rye Breeding Bibliography	1	6
Bibliography on Breeding Sorghums and Millets	1	0
The Experimental Production of Haploids and Polyploids	2	6
Tobacco Breeding Bibliography	1	0
Bibliography of Baking Quality Tests, Supplement	1	6
Bibliography on Cold Resistance	1	6

Subscriptions to any of the above Publications should be sent to Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales.

Loss in Transit.—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

IMPERIAL AGRICULTURAL BUREAUX

IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,

School of Agriculture,

Cambridge, England,

covers current literature on the breeding, genetics, and cytology of economic plants, including forage crops, fruits, and forest trees, and relevant publications in allied fields, such as applied statistics, plant pathology and other sciences.

For publications see inside cover.

IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS,

Aberystwyth, Great Britain,

covers current literature on grassland and forage crop research, the botanical aspect of soil conservation and certain plant biological research.

Publications: Herbage Abstracts, 25/- per annum,* 7/- per quarter.
Herbage Reviews, 15/- per annum, 4/- per quarter. (Discontinued at the end of 1940 until further notice).

IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS,

East Malling, Kent, England,

covers current literature on horticulture, including fruit, vegetables, commercial flower production, the cultivation of tropical plantation crops and the storage and processing of horticultural products.

Publication: Horticultural Abstracts, 25/- per volume,* single copies 6/6.

IMPERIAL FORESTRY BUREAU,

39, Museum Road,

Oxford, England,

covers current literature on all branches of forestry and issues a quarterly publication.

Publication: Forestry Abstracts, 25/- per annum,* single copies 7/6.

IMPERIAL BUREAU OF SOIL SCIENCE,

Rothamsted Experimental Station,

Harpenden, Herts.,

covers current literature on soil science, and issues an abstracting journal six times yearly.

Publication: Soils and Fertilizers, 25/- per annum.*

* These prices are subject to a reduction of 5/- per volume to subscribers within the British Commonwealth sending their subscriptions direct to the Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales. Certain Bureaux publish special editions of their abstracts journals printed on one side of the paper only, for use in card indexes.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND